# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

| 1. CONTRACT ID CODE | PAGE | OF | PAGES |
|---|---|---|---|
| | 1 | | 3 |

| 2. AMENDMENT/MODIFICATION NO. | 3. EFFECTIVE DATE | 4. REQUISITION/PURCHASE REQ. NO. | 5. PROJECT NO. *(If applicable)* |
|---|---|---|---|
| 0002 | 22 AUGUST 2000 | | |

| 6. ISSUED BY | CODE | 7. ADMINISTERED BY *(If other than Item 6)* | CODE |
|---|---|---|---|
| US ARMY ENGINEER DISTRICT, FORT WORTH<br>ATTN: CESWF-CT (RM 2A19)<br>PO BOX 17300<br>FORT WORTH, TX 76102-0300 | | | |

| 8. NAME AND ADDRESS OF CONTRACTOR *(No., street, county, State and ZIP Code)* | (X) | 9A. AMENDMENT OF SOLICIATION NO. |
|---|---|---|
| | ☒ | DACA63-00-B-0028 |
| | | 9B. DATED *(SEE ITEM 11)*<br>31 JULY 2000 |
| | ☐ | 10A. MODIFICATION OF CONTRACT/ORDER NO. |
| | | 10B. DATED *(SEE ITEM 11)* |
| CODE / FACILITY CODE | | |

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☒ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☒ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a)By completing items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment your desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*

## 13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

| CHECK ONE | |
|---|---|
| | A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A. |
| | B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES *(such as changes in paying office, appropriation date, etc.)* SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b). |
| | C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: |
| | D. OTHER *(Specify type of modification and authority)* |

**E. IMPORTANT:** Contractor ☐ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (*Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

The Solicitation for BARRACKS REBUILD, 9200 BLOCK, FORT HOOD, TEXAS, is amended as follows:

See Continuation Sheets.

NOTE: Bid Opening Date and Time remains "31 AUGUST 2000, AT 2 P.M. LOCAL TIME," as previously announced.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

| 15A. NAME AND TITLE OF SIGNER *(Type or print)* | | 16A. NAME AND TITLE OF CONTRACTING OFFICER *(Type or print)* | |
|---|---|---|---|
| 15B. CONTRACTOR/OFFEROR<br>*(Signature of person authorized to sign)* | 15C. DATE SIGNED | 16B. UNITED STATES OF AMERICA<br>*(Signature of Contracting Officer)* | 16C. DATE SIGNED |

Item 14. Continued.

**A. CHANGES TO THE SPECIFICATIONS (VOLUME I - DINING FACILITY)**

1).- The following sections shall be voided and the accompanying new sections of the same title and number, each bearing the notation "ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-00-B-0028," shall be substituted therefor.

01000 CONSTRUCTION SCHEDULE
15895 AIR SUPPLY, DISTRIBUTION, VENTILATION AND EXHAUST SYSTEM

2) Add the following accompanying new sections, each bearing the notation "ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-00-B-0028," and add to the Table of Contents:

01312 RESIDENT MANAGEMENT SYSTEM (RMS)
02870 SITE FURNISHINGS
02920 TOPSOIL
02933 ESTABLISHMENT OF TURF
02940 MULCHING FOR EROSION CONTROL
02961 PLANTING OF TREES, SHRUBS, AND VINES

**B. CHANGES TO THE SPECIFICATIONS (VOLUME II - BARRACKS AND CENTRAL PLANT)**

1) SECTION 08700 - BUILDERS' HARDWARE.- This section shall be voided and the accompanying new section of the same title and number, bearing the notation "ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-00-B-0028," shall be substituted therefor.

2) Delete the following sections in their entirety and delete from the Table of Contents:

02220 DEMOLITION
02230 CLEARING AND GRUBBING
02300 EARTHWORK
02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS
02510 WATER DISTRIBUTION SYSTEM
02531 SANITARY SEWERS
02556 GAS DISTRIBUTION SYSTEM
02630 STORM-DRAINAGE SYSTEM
02721 SUBBASE COURSE
02722 AGGREGATE AND/OR GRADED-CRUSHED AGGREGATE BASE COURSE
02741 HOT-MIX ASPHALT (HMA) FOR ROADS
02748 BITUMINOUS TACK AND PRIME COATS
02754 CONCRETE PAVEMENT FOR SMALL PROJECTS
02763 PAVEMENT MARKINGS
02770 CONCRETE SIDEWALKS AND CURBS AND GUTTERS
02781 BRICK PAVERS
02812 IRRIGATION (SPRINKLER) SYSTEM
02870 SITE FURNISHINGS
02920 TOPSOIL
02933 ESTABLISHMENT OF TURF
02940 MULCHING FOR EROSION CONTROL
02961 PLANTING OF TREES, SHRUBS, AND VINES

**C. CHANGES TO THE DRAWINGS.**

Replacement Drawings.- Replace the drawings listed below with the attached new drawings(s) of the same number, bearing the notation "AM #0002":

l01_2.cal Seq 29 L-1 PLANTING PLAN - DINING FACILITY
l02_2.cal Seq 30 L-2 PLANTING PLAN - BARRACKS AREA
h01_2.cal Seq 37 H-1 REGULATED MATERIAL SAMPLE LOCATIONS & QUANTITIES - BUILD. NO. 9210
h02_2.cal Seq 38 H-2 REGULATED MATERIAL SAMPLE LOCATIONS & QUANTITIES - BUILD. NO. 9211
h03_2.cal Seq 39 H-3 REGULATED MATERIAL SAMPLE LOCATIONS & QUANTITIES - BUILD. NO. 9213
h04_2.cal Seq 40 H-4 REGULATED MATERIAL SAMPLE LOCATIONS & QUANTITIES - BUILD. NO. 9214
h05_2.cal Seq 41 H-5 EROSION AND SEDIMENT CONTROL PLAN 1
h06_2.cal Seq 42 H-6 EROSION AND SEDIMENT CONTROL PLAN 2
h07_2.cal Seq 43 H-7 EROSION AND SEDIMENT CONTROL PLAN 3
h08_2.cal Seq 44 H-8 EROSION AND SEDIMENT CONTROL STRUCTURAL DETAILS
ad02_2.cal Seq 46 AD-02 DINING - FLOOR PLAN
ad05_2.cal Seq 49 AD-05 DINING - BUILDING ELEVATIONS I
ad08_2.cal Seq 52 AD-08 DINING - WALL SECTIONS I
ad10_2.cal Seq 54 AD-10 DINING - REFLECTED CEILING PLAN
ad12_2.cal Seq 56 AD-12 DINING - DOORS, WINDOWS, & PARTITIONS
ad16_2.cal Seq 60 AD-16 DINING - MISCELLANEOUS DETAILS II
kd02_2.cal Seq 63 KD-02 DINING - KITCHEN EQUIPMENT SCHEDULE I
kd03_2.cal Seq 64 KD-03 DINING - KITCHEN EQUIPMENT SCHEDULE II
kd04_2.cal Seq 65 KD-04 DINING - KITCHEN EQUIPMENT SCHEDULE III
ed05_2.cal Seq 136 ED-5 ENLARGE KITCHEN EQUIPMENT POWER PLAN II
ab01_2.cal Seq 145 AB-01 BARRACKS - LIFE SAFETY PLANS
ab03_2.cal Seq 147 AB-03 BARRACKS - FIRST FLOOR PLAN
ab04_2.cal Seq 148 AB-04 BARRACKS - SECOND FLOOR PLAN
ab05_2.cal Seq 149 AB-05 BARRACKS - THIRD FLOOR PLAN
ab07_2.cal Seq 151 AB-07 BARRACKS - ENLARGED PLANS
ab15_2.cal Seq 159 AB-15 BARRACKS - ROOM FINISH SCHEDULE
ab16_2.cal Seq 160 AB-16 BARRACKS- - FIRST FLOOR REFLECTED CEILING PLAN
ab17_2.cal Seq 161 AB-17 BARRACKS- - SECOND FLOOR REFLECTED CEILING PLAN
ab18_2.cal Seq 162 AB-18 BARRACKS - THIRD FLOOR REFLECTED CEILING PLAN
ab21_2.cal Seq 165 AB-21 BARRACKS - DOOR SCHEDULE
sb16_2.cal Seq 197 SB-16 BARRACKS - PICNIC SHELTER
mb10_2.cal Seq 210 MB-10 MECHANICAL SCHEDULES AND LEGEND
mb12_2.cal Seq 212 MB-12 HVAC PLAN - FIRST FLOOR
mb13_2.cal Seq 213 MB-13 HVAC PLAN - SECOND FLOOR
mb14_2.cal Seq 214 MB-14 HVAC PLAN - THIRD FLOOR
mb15_2.cal Seq 215 MB-15 LARGE SCALE HVAC PLAN - FIRST FLOOR ADMINISTRATION AREA
mb16_2.cal Seq 216 MB-16 LARGE SCALE HVAC PLAN - TYPICAL FIRST FLOOR LIVING UNIT
mb17_2.cal Seq 217 MB-17 LARGE SCALE HVAC PLAN - SECOND FLOOR
mb23_2.cal Seq 223 MB-23 HVAC CONTROL DIAGRAMS
mb25_2.cal Seq 225 MB-25 PLUMBING PLAN - FIRST FLOOR
mb26_2.cal Seq 226 MB-26 PLUMBING PLAN - SECOND FLOOR
mb27_2.cal Seq 227 MB-27 PLUMBING PLAN - THIRD FLOOR
eb02_2.cal Seq 250 EB-2 FIRST FLOOR LIGHTING PLAN - ALL BLDGS
eb04_2.cal Seq 252 EB-4 SECOND & THIRD FLOOR LIGHTING PLAN - ALL BLDGS
eb05_2.cal Seq 253 EB-5 FIRST FLOOR POWER PLAN - ALL BLDGS
eb07_2.cal Seq 255 EB-7 SECOND & THIRD FLOOR POWER PLAN - ALL BLDGS
eb10_2.cal Seq 258 EB-10 TELEPHONE RISER DIAGRAM

END OF AMENDMENT

SECTION 01000

CONSTRUCTION SCHEDULE
**AM#0002**

PART 1 GENERAL

1.1 SCHEDULE

Commence, prosecute, and complete the work under this contract in accordance with the following schedule and Section 00800 SPECIAL CONTRACT REQUIREMENT clauses COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK and LIQUIDATED DAMAGES:

| Item of Work | Commencement of Work (calendar days) | Completion of Work (calendar days) | Liquidated Damages per calendar day |
|---|---|---|---|
| (1a)Move building 926, (delay start for material) | 60 days after notice to proceed | 60 | $100.00 |
| (1b) Demolish/Replace communications to barracks | 10 days after notice to proceed | 90 | $100.00 |
| (1c) Central Plant expansion and lines | 10 days after notice to proceed | 300 | $100.00 |
| (2) Dining Facility | 90 days after notice to proceed | 380 | $800.00 |
| (3) Building 9213 | 10 days after notice to proceed | 300 | $925.00 |
| (4) Building 9214 | 45 days after notice to proceed | 335 | $925.00 |
| (5) Building 9210 | 30 days after Bldg 9213 is complete | 300 | $925.00 |
| (6) Building 9211 | 30 days after Bldg 9214 is complete | 300 | $925.00 |

| | | | |
|---|---|---|---|
| (7) Establishment of Turf | * | * | --- |
| (8) Landscaping | ** | ** | --- |

*Establishment of Turf

Planting and maintenance for turfing shall be in accordance with Section 02933 ESTABLISHMENT OF TURF. No payment will be made for establishment of turf until all requirements of the section are adequately performed and accepted, as determined by the Contracting Officer.

**Landscaping

Planting and maintenance for landscaping shall be in accordance with 02961 PLANTING OF TREES, SHRUBS, AND VINES. No payment will be made for landscaping until all requirements of the section are adequately performed and accepted, as determined by the Contracting Officer.

1.1.1 Testing of Heating and Air-Conditioning Systems

The times stated for completion of this project includes all required testing specified in appropriate specification sections of heating, air conditioning and ventilation systems including HVAC Commissioning. Exception: boiler combustion efficiency test, boiler full load tests, cooling tower performance tests, and refrigeration equipment full load tests, when specified in the applicable specifications, shall be preformed in the appropriate heating/cooling season as determined by the Contracting Officer.

1.2 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER (OCT 1989) (ER 415-1-15)(52.0001-4038 1/96)

a. This provision specifies the procedure for determination of time extensions for unusually severe weather in accordance with the contract clause entitled "Default: (Fixed Price Construction)." In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

(1) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

(2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the contractor.

b. The following schedule of monthly anticipated adverse weather delays due to precipitation and temperature is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location

and will constitute the base line for monthly weather time evaluations. The contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities. Wind is not considered in the Monthly Anticipated Adverse Weather Calendar Day Schedule.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY
WORK DAYS BASED ON (5) DAY WORK WEEK

KILLEEN, TX AREA (FORT HOOD, BELTON AND STILLHOUSE LAKES AND RESERVE CTRS. ALONG HWY 36 FROM HWY 79 TO HWY US67)

| JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 4 | 4 | 4 | 6 | 4 | 3 | 3 | 4 | 4 | 3 | 4 |

c. Upon acknowledgment of the Notice to Proceed (NTP) and continuing throughout the contract, the contractor will record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the contractor's scheduled work day.

The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph "b", above, the Contracting Officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the contract clause entitled "Default (Fixed Price Construction)."

## 1.3 CONSTRUCTION PHASING

### 1.3.1 Phasing Requirements

Buildings 922, 923 and 924 will be demolished in accordance with the award of Option No. 1.

Buildings 9215, 9216, 9217 and 9218 are to be completed 90 days after Central Plant is online.

All site work must be completed concurrently with each building except turf and landscaping.

1. All utilities, power and services shall be maintained to Bldgs. 9210 and 9211 until they are under construction in accordance with the schedule. During the first 90 calendar days after notice to proceed, provide new commo service (fiber and copper) to Bldgs. 9210 and 9211. All tie-ins shall be to existing terminal boards and shall be provided by contractor. It is the intent that this service (including manhole splicing required) become permanent and shall later be tied to new interior building service during construction on these buildings.

2. All utilities, power and service (including street access) shall be

maintained to Bldgs. 922, 923 and 924 for 90 calendar days after notice to proceed, or until new temporary commo service is completed, whichever is later. These three buildings shall be removed by others within 30 calendar days after that time. Contractor shall then be given access to this area south of Old Park for demolition.

3. All utilities, power and service (including street access) shall be maintained to Bldg. 926 for 60 calendar days after notice to proceed.

See paragraph 1.1 SCHEDULE.

1.4 WORK RESTRICTIONS

1.4.1 Working Hours

The normal duty working shift is Sunday to Sunday, 6:00 a.m. to 7:00 p.m.

1.5 UTILITIES

1.5.1 Payment for Utility Services (FAR 36.303(C)(6))

Water, gas, and electricity are available from Government-owned and operated systems and will be charged to the Contractor at rates as provided in Contract Clause 52.236.14 AVAILABILITY AND USE OF UTILITY SERVICES.

1.5.2 Outages

The Contractor shall coordinate all requests for utility outages with the Contracting Officer in writing 14 days prior to date of requested outage:

a. Water, gas, steam, and sewer outages shall be held to a maximum duration of 4 hours unless otherwise approved in writing.

b. Electrical outages shall have a maximum duration of 4 hours.

1.6 STREET CLOSINGS

The Contractor shall coordinate all requests for street closings with the Contracting Officer in writing 30 days prior to date of requested outage:

a. One lane traffic shall be maintained at all times (except that a total closing may be allowed for specific 4-hour periods).

b. The final street repair shall be completed within 14 days after the start of any street crossing. Any part of the street returned to service prior to final repair shall be maintained smooth with hot-mix cold-lay surface course.

c. Open cuts across paved roads and streets for utility crossings will not be allowed. Utility crossings will be accomplished by boring or jacking procedures only.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION 01312

RESIDENT MANAGEMENT SYSTEM (RMS)
**Am#0002**

1.1 GENERAL

The Government will use the Resident Management System for Windows (RMS-W) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS-Windows, referred to as RMS-QC (QC for Quality Control), to record, maintain, and submit various information throughout the contract period. This joint Government-Contractor use of RMS-W and RMS-QC will facilitate electronic exchange of information and overall management of the contract. RMS-QC provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

Administration
Finances
Quality Control
Submittal Monitoring
Scheduling
Import/Export of Data

1.1.1 Correspondence and Electronic Communications

For ease and speed of communications, both Government and Contractor will, to the maximum extent feasible, exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

1.2 Other Factors

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01320, "Project Schedule", Section 01330, SUBMITTAL PROCEDURES, and Section 01451, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through RMS-QC. Also, there is no separate payment for establishing and maintaining the RMS-QC database; all costs associated therewith shall be included in the contract pricing for the work.

1.3 RMS-QC SOFTWARE

RMS-QC is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the RMS-QC software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the RMS-QC software from

the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide RMS-QC on high-density diskettes or CD-ROM. Any program updates of RMS-QC will be made available to the Contractor via the Government RMS Website as they become available.

1.4 SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run RMS-QC:

**Hardware**

IBM-compatible PC with 500 MHz Pentium or higher processor

64 MB RAM

4 GB hard drive disk space for sole use by the RMS-QC system

3 1/2 inch high-density floppy drive

Compact disk (CD) Reader

Color monitor

Laser printer compatible with HP LaserJet III or better, with minimum 4 MB installed memory.

Connection to the Internet, minimum 56K

**Software**

Microsoft (MS) Access 97 or newer version database software

MS Windows 98 or newer version operating system

MS Word 97 software

Microsoft Exchange 97 or compatible electronic mail

Microsoft Explorer or compatible internet browser

The Contractor's computer system shall be protected by virus protection software that is regularly upgraded with all issued manufacturer's updates throughout the life of the contract.

1.5 RELATED INFORMATION

1.5.1 RMS-QC User Guide

After contract award, the Contractor shall download instructions for the installation and use of RMS-QC from the Government RMS Internet Website; the Contractor can obtain the current address from the Government. In

case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

1.5.2 Contractor Quality Control(CQC) Training

The use of RMS-QC will be discussed with the Contractor's QC System Manager during the mandatory CQC Training class.

1.5.3 Video Training for RMS-QC

After contract award, the Contractor will be provided with a CD containing a training video on the use of RMS-QC.

1.6 CONTRACT DATABASE

Prior to the pre-construction conference, the Government shall provide the Contractor with basic contract award data to use for RMS-QC. The Government will provide data updates to the Contractor as needed, generally by files attached to E-mail. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

1.7 DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the RMS-QC database throughout the duration of the contract. The Contractor shall establish and maintain the RMS-QC database at the Contractor's site office. Data updates to the Government shall be submitted by E-mail with file attachments, e.g., daily reports, schedule updates, payment requests. If permitted by the Contracting Officer, a data diskette or CD-ROM may be used instead of E-mail (see Paragraph DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM). The RMS-QC database typically shall include current data on the following items:

1.7.1 Administration

1.7.1.1 Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of RMS-QC software from the Government, the Contractor shall deliver Contractor administrative data in electronic format via E-mail.

1.7.1.2 Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in RMS-QC. Within 14 calendar days of receipt of RMS-QC software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format via E-mail.

1.7.1.3 Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

1.7.1.4 Requests for Information

RMS-QC includes a means for the Contractor to enter, log, and transmit requests for information (RFI) to the Government. RFIs can be exchanged electronically using the import/export functions of RMS-QC. The Contractor shall also provide the Government with a signed, printed copy of each RFI. All RFIs from the Contractor to the Government shall have the prefix "RFI" and shall be numbered sequentially beginning with RFI-0001.

1.7.1.5 Equipment

The Contractor's RMS-QC database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

1.7.1.6 EM 385-1-1, Corps of Engineers Safety Manual and RMS Linkage

Upon request, the Contractor can obtain a copy of the current version of the Safety Manual, EM 385-1-1, on CD. Data on the CD will be accessible through RMS-QC, or in stand-alone mode.

1.7.1.7 Management Reporting

RMS-QC includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of RMS-QC. Among these reports are: Progress Payment Request worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

1.7.2 Finances

1.7.2.1 Pay Activity Data

The RMS-QC database shall include a list of pay activities that the Contractor shall develop in conjunction with the construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

1.7.2.2 Payment Requests

All progress payment requests shall be prepared using RMS-QC. The Contractor shall complete the payment request worksheet and include it with

the payment request. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using RMS-QC. The Contractor shall submit the payment requests with supporting data by E-mail with file attachment(s). If permitted by the Contracting Officer, a data diskette may be used instead of E-mail. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

1.7.3 Quality Control (QC)

RMS-QC provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the RMS-QC generated daily report. The Contractor shall provide the Government a Contractor Quality Control (CQC) Plan within the time required in Section 01451, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a data diskette or CD-ROM reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

1.7.3.1 Daily Contractor Quality Control (CQC) Reports.

RMS-QC includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by RMS-QC shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the RMS-QC-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01451, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government using E-mail or diskette within 24 hours after the date covered by the report. Use of either mode of submittal shall be coordinated with the government representative. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

1.7.3.2 Deficiency Tracking.

The Contractor shall use RMS-QC to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC Comments. The contractor shall maintain a current log of its QC comments in the RMS-QC database. The Government will log the deficiencies it has identified using its QA comments. The Government's QA comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA comments.

1.7.3.3 Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in RMS-QC.

1.7.3.4 Accident/Safety Tracking.

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize RMS-QC to advise the Government of any accidents occurring on the jobsite. This brief supplemental entry is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 200.

1.7.3.5 Features of Work

The Contractor shall include a complete list of the features of work in the RMS-QC database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

1.7.3.6 QC Requirements

The Contractor shall develop and maintain a complete list of QC testing, transferred and installed property, and user training requirements in RMS-QC. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via RMS-QC.

1.7.4 Submittal Mnagement

The Government will provide the initial submittal register, ENG Form 4288, SUBMITTAL REGISTER, in electronic format. Thereafter, the Contractor shall maintain a complete list of all submittals, including completion of all data columns as described in Section 01330, SUBMITTAL PROCEDURES. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use RMS-QC to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using RMS-QC. RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

1.7.5 Schedule

The Contractor shall develop a construction schedule consisting of pay activities, in accordance with Contract Clause "Schedules for Construction Contracts", or Section 01320, PROJECT SCHEDULE, as applicable. This schedule shall be input and maintained in the RMS-QC database either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01320 PROJECT SCHEDULE). The updated schedule data shall be included with each pay request submitted by the Contractor.

1.7.6 Import/Export of Data

RMS-QC includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data, and schedule data using SDEF.

1.8 IMPLEMENTATION

Contractor use of RMS-QC as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its RMS-QC database, and to provide the Government with regular database updates. RMS-QC shall be an integral part of the Contractor's management of quality control.

1.9 DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of updates, payment requests, correspondence and other data is by E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of computer diskettes or CD-ROM for data transfer. Data on the disks or CDs shall be exported using the RMS-QC built-in export function. If used, diskettes and CD-ROMs will be submitted in accordance with the following:

1.9.1 File Medium

The Contractor shall submit required data on 3-1/2" double-sided high-density diskettes formatted to hold 1.44 MB of data, capable of running under Microsoft Windows 95 or newer. Alternatively, CD-ROMs may be used. They shall conform to industry standards used in the United States. All data shall be provided in English.

1.9.2 Disk or CD-ROM Labels

The Contractor shall affix a permanent exterior label to each diskette and CD-ROM submitted. The label shall indicate in English, the RMS-QC file name, full contract number, project name, project location, data date, name and telephone number of person responsible for the data.

1.9.3 File Names

The Government will provide the file names to be used by the Contractor with the RMS-QC software.

1.10 MONTHLY COORDINATION MEETING

The Contractor shall update the RMS-QC database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions. The contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable RMS-QC export file is received.

1.11 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification.

-- End of Section --

SECTION 02870

SITE FURNISHINGS
**08/2000**
**AMENDMENT 0002**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications shall be referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|---|---|
| ASTM A 36/A 36M | (1996) Carbon Structural Steel |
| ASTM A 48 | (1994a) Gray Iron Castings |
| ASTM A 48M | (1994) Gray Iron Castings (Metric) |
| ASTM A 123 | (1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products |
| ASTM A 153 | (1996) Zinc Coating (Hot-Dip) on Iron and Steel Hardware |
| ASTM A 500 | (1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes |
| ASTM A 501 | (1993) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing |
| ASTM A 615/A 615M | (1996a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement |
| ASTM B 26/B 26M | (1996a) Aluminum-Alloy Sand Castings |
| ASTM B 62 | (1993) Composition Bronze or Ounce Metal Castings |
| ASTM B 108 | (1996a) Aluminum-Alloy Permanent Mold Castings |
| ASTM C 150 | (1996) Portland Cement |
| ASTM D 648 | (1996) Deflection Temperature of Plastics Under Flexural Load |

| | |
|---|---|
| ASTM D 2990 | (1995) Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics |
| ASTM F 1487 | (1995) Standard Consumer Safety Performance Specification for Playground Equipment for Public Use |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Site Furnishings; GA.

Manufacturer's descriptive data and catalog cuts.

SD-04 Drawings.

Site Furnishing Standards; GA.

Drawings showing scaled details of proposed site furnishings, elevations for each type of site furnishing; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction.

SD-06 Instructions

INSTALLATION; FIO.

Manufacturer's installation and maintenance instructions.

SD-08 Statements

Materials; FIO.

A listing indicating the furnishings provided have been in proven satisfactory use for at least 2 years.

SD-14 Samples

FINISH; GA.

Two sets of color data for each furnishing displaying manufacturer's color selections and finishes, and identifying those colors and finishes proposed for use.

1.3 DELIVERY, STORAGE, AND HANDLING

Materials shall be delivered, handled, and stored in accordance with the

manufacturer's recommendations. The storage area shall be as designated. The materials shall be stored in a dry, covered area until installed.

1.4 INSPECTION

Site furnishings shall be inspected upon arrival at the job site for conformity to specifications and quality in accordance with paragraph MATERIALS. Unacceptable items shall be removed from the job site.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall be the standard products of a manufacturer regularly engaged in the manufacture of such products. The materials provided shall be of a type with proven satisfactory use for at least 2 years.

2.1.1 Concrete

Portland cement shall conform to ASTM C 150 Types I, II, or III.

2.1.1.1 Pre-cast Concrete

Pre-cast concrete material and products shall conform to Section 03413 PRECAST ARCHITECTURAL CONCRETE.

2.1.2 Metal

Metallic materials and products shall conform to Section 05500 MISCELLANEOUS METAL. Metal components shall be furnished with factory drilled holes. Components shall be free of excess weld and spatter. Metal components with holes that will not be filled by hardware or hidden by other components will be rejected.

2.1.2.1 Cast Aluminum

Cast aluminum shall conform to ASTM B 26/B 26M and ASTM B 108. The Contractor shall provide castings manufactured true to pattern and component parts that fit together in a satisfactory manner. Castings shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage, distortion, or other defects. Smooth castings shall be well-cleaned by sand or shot blasting.

2.2 HARDWARE

Hardware shall be stainless steel, or galvanized steel in accordance with ASTM A 153 and compatible with the material to which applied. All exposed hardware shall match in color and finish. Mounting hardware shall be concealed, recessed, and plugged.

2.3 ANCHORS

Anchors shall be provided, where necessary, for fastening site furnishings securely in place and in accordance with approved manufacturer's

instructions. Anchoring devices that may be used, when no anchors are otherwise specified or indicated, include anchor bolts, slotted inserts, expansion shields for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; and lag bolts and screws for wood.

## 2.4 FINISH

Finish shall be as specified by the manufacturer or as indicated. Exposed surfaces and edges shall be rounded, polished, or sanded. Finish shall be non-toxic, non-glare, and resistant to corrosion. Exposed surfaces shall be smooth and splinter-free exposed surfaces.

### 2.4.1 Coatings

#### 2.4.1.1 Galvanizing

Galvanized components shall be hot-dipped in zinc after fabrication in accordance with ASTM A 123. Tailings and sharp protrusions formed as a result of the hot-dip process shall be removed and exposed edges burnished.

### 2.4.2 Color

Color of site furnishing components shall be in accordance with Section 09915 COLOR SCHEDULE.

## 2.5 SITE FURNISHING STANDARDS

Site furnishings shall be furnished with the dimensions and requirements indicated.

### 2.5.1 Benches and Chairs

Benches and chairs shall be furnished with no sharp edges or protruding hardware.

#### 2.5.1.1 Height of Benches and Chairs

The height above finished grade or specified surface shall be between 450-500 mm and level.

#### 2.5.1.2 Seat

The seat surface shall be pitched or slotted to shed water; the seat depth shall be between 300-460 mm and pitched down at the back at a 0-5 degree angle. Seat shall have a minimum width of 610 mm per person, and shall overhang the support base by a minimum of 100 mm for heel space and to facilitate rising from a seating position.

#### 2.5.1.3 Weight Limit

Seats shall support a minimum 136 kg for each person they are designed to accommodate.

### 2.5.2 Tables

(AM#0002)Round tables shall be furnished with attached or detached benches that have no backrests. Tables shall have an opening in the center which will accommodate an outdoor table umbrella. Tables' exposed edges and corners shall be rounded, eased or chamfered.

2.5.2.1 Table Height

The table height shall be between 750-1200 mm from the finished grade to the lowest surface of the top, or as noted.

2.5.2.2 Clearance

A minimum vertical clearance of 230 mm between the seat top and the bottom edge of the table top shall be provided. A minimum of 460 mm of leg space under tables, measured from the inside edge of the seat top to the nearest table support, shall be provided. A minimum of 460 mm from the end of the table top to the nearest support leg shall be provided.

2.5.2.3 Top

Table top surfaces shall not contain recesses that might hold water or food particles. The table top width shall be a minimum of460 mm when utilized from one side only, and a minimum of 900 mm when utilized from two sides. The table top length shall be a minimum of 610 mm per person.

2.5.2.4 Wheelchair Accessibility

A minimum clear space of 740 mm from the finished grade to the underside of the table shall be provided for persons with disability to be able to pull a wheelchair beneath the table top at the end of the table; the minimum clear width shall be 860 mm .

2.5.3 Trash and Litter Receptacles

Trash and litter receptacles shall be furnished with weather protection, odor containment, and insect/animal-proofing. Container size shall be between 800-1000 mm tall.

2.5.3.1 Height

Trash and litter deposit openings shall be between 800-1000 mm above the ground.

2.5.3.2 Liners

Trash and litter receptacles shall be furnished with disposable inner-linings. Self-dumping type designs to include hinged bottom, top or sides will be rejected.

2.5.3.3 Anchors

Trash and litter receptacles that can be anchored to resist overturning by typical use, high winds, or animals shall be furnished and anchored in

accordance with the manufacturer's recommendations.

2.5.3.4 Openings

Openings for trash and litter insertion shall be a minimum of 100 mm in diameter. Edges of the openings shall be crimped, rounded and smoothed.

2.5.4 Umbrellas

Umbrella shall have a minimum diameter of 2.2 meters, have aluminum pole/mast and ribs and a crank mechanism to open and close. Fabric grade shall be marine weight and vented to increase wind resistance.

PART 3 EXECUTION

3.1 INSTALLATION

The Contractor shall verify that finished grades and other operations affecting mounting surfaces have been completed prior to the installation of site furnishings. Site furnishings shall be installed plumb and true in accordance with the approved manufacturer's instructions.

3.1.1 Assembly

When the inspection of parts has been completed, the site furnishings shall be assembled and anchored according to manufacturer's instructions or as indicated. When site furnishings are assembled at the site, assembly shall not interfere with other operations or pedestrian and vehicular circulation.

3.1.2 Testing

Each site furnishing shall be tested to determine a secure and correct installation. A correct installation shall be according to the manufacturer's recommendations and by the following procedure: The Contractor shall measure the physical dimensions and clearance of each installed site furnishing for compliance with manufacturer's recommendations and as indicated. Site furnishings which do not comply shall be reinstalled. Fasteners and anchors determined to be non-compliant shall be replaced. A written report describing the results of the testing shall be provided.

3.2 RESTORATION AND CLEAN UP

When the installation has been completed, the Contractor shall clean up and protect the site. Existing areas that have been damaged from the installation operation shall be restored to original condition at Contractor's expense.

3.2.1 Clean Up

The site shall be cleaned of all materials associated with the installation. Site furnishing surfaces shall be cleaned of dirt, stains, filings, and other blemishes occurring from shipment and installation. Cleaning methods and agents shall be according to manufacturer's

instructions or as indicated.

3.2.2 Protection

The area shall be protected as required or directed by providing barricades and signage. Signage shall be in accordance with Section 10430 EXTERIOR SIGNAGE.

3.2.3 Disposal of Materials

Excess and waste material shall be removed and disposed off Government property.

3.3 RE-INSTALLATION

Where re-installation is required, the following shall be accomplished:

a. Re-install the product as specified. Material acquisition of replacement parts is the responsibility of the Contractor. Provide replacement materials that are new and supplied by the original manufacturer to match.

b. Damage caused by the failed installation shall be repaired.

-- End of Section --

SECTION 02920

TOPSOILING
08/2000
**AMENDMENT** 0002

PART 1 GENERAL

1.1 REFERENCES (NOT APPLICABLE)

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Schedules

Construction Equipment List; FIO.

The Contractor shall furnish a list and description of the equipment that is proposed for handling and placing all topsoil.

SD-13 Certificates

Topsoil; FIO.

The Contractor shall furnish a certificate of compliance and analysis certifying that the topsoil proposed for use at the project site conforms to the specified requirements.

1.3 INSPECTION

Not less than 5 days prior to the commencement of topsoiling operations, the Contracting Officer shall be notified of the offsite sources from which topsoil is to be furnished. The material will be inspected to determine whether the selected topsoil meets the requirements. The topsoil shall be approved prior to use.

PART 2 PRODUCTS

2.1 TOPSOIL

All topsoil necessary to complete the work shall be obtained from topsoil stockpiles from grading and excavating operations or from approved topsoil sources off of Government controlled property. Topsoil from approved sources and stockpiled topsoil shall be natural, friable, topsoil characteristic of representative soils in the vicinity that produce heavy growths of crops, grass, or other vegetation. Topsoil shall be free from

tree roots, stones, shale, parent and other materials that hinder grading, planting, plant growth and maintenance operations, and free from noxious and other objectionable weed seeds and toxic substances.

## PART 3 EXECUTION

### 3.1 GENERAL

Graded areas shall be topsoiled where it is determined by the Contracting Officer that at least 100 mm of suitable topsoil for the growth of grass is not present. Equipment necessary for handling and placing all materials required shall be on hand, in good condition and shall be approved before the work is started. Grades on the areas to be topsoiled are shown on the drawings and shall be maintained in a true and even condition.

### 3.2 TILLAGE

Immediately prior to dumping and spreading the topsoil, the subgrade shall be double tilled to a depth of 50 mm using a chisel plow with the 1 chisels set not more than 250 mm apart. Tillage shall be accomplished across the slope.

### 3.3 OBTAINING TOPSOIL

After inspection and approval of the source of topsoil, and prior to stripping, rank growths of vegetation, stones, or debris on the surface that might interfere with grading or later tillage operations shall be removed. Sod or other cover that cannot be disked or otherwise incorporated into the topsoil so that the topsoil can be spread properly shall be removed. Topsoil shall be removed to the depth specified by the Contracting Officer.

### 3.4 PLACING TOPSOIL

Topsoil shall be uniformly distributed and evenly spread to an average thickness of 100 mm , with a minimum thickness of 76 mm . Topsoil shall be spread so that planting can proceed with little additional soil preparation or tillage. Surface irregularities resulting from topsoiling or other operations shall be leveled to prevent depressions. The grades shall be adjusted to assure that the planted grade shall be 25 mm below the adjoining grade of any surfaced area. Topsoil shall not be placed when the subgrade is frozen, excessively wet or compacted, extremely dry, or in a condition detrimental to the proposed planting or grading.

### 3.5 CLEANUP

Prior to topsoiling, vegetation that may interfere with operations shall be mowed, grubbed, and raked. The collected material shall be removed from the site. The surface shall be cleaned of stumps, and stones larger than 1 inch in diameter, and roots, cable, wire and other materials that might hinder the work or subsequent maintenance shall also be removed.

### 3.6 REPAIR

Where any portion of the surfaces becomes gullied or otherwise damaged, the affected area shall be repaired to establish the condition and grade prior to topsoiling, and then shall be re-topsoiled as specified in paragraph "PLACING TOPSOIL."

-- End of Section --

SECTION 02933

ESTABLISHMENT OF TURF
08/2000
**AMENDMENT 0002**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ASSOCIATION OF OFFICIAL ANALYTICAL CHEMISTS (AOAC)

AOAC-01 Official Methods of Analysis

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-1909 (Basic; Notice 1) Fertilizer

UNITED STATES DEPARTMENT OF AGRICULTURE (USDA)

USDA Part 201 Federal Seed Act Regulations

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. Six copies each of the following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES and prior to commencement of planting operations:

SD-07 Schedules

Turfing Equipment List; FIO.

Prior to planting operations, the Contractor shall furnish for approval, notification of the types of equipment, including descriptive data, he/she proposes to use in turfing operations such as preparation of ground surface, smoothing, fertilizing, seeding, mulching, sod-cutting, compacting, mowing, and watering.

SD-09 Reports

Fertilizer; FIO.

Seed ; FIO.

Test reports of samples of fertilizer and seed shall be signed and certified by the testing laboratory. Testing laboratories used by the Contractor shall be approved by the Contracting Officer.

SD-13 Certificates

Fertilizer; FIO.

Bulk deliveries of fertilizer shall be accompanied by a certificate indicating net pounds furnished, chemical analysis, name, trade name, and warranty of the supplier of the fertilizer.

Seed; FIO.

The Contracting Officer shall be furnished signed copies of certificates from the seed vendor, certifying that each container of seed delivered is labeled in accordance with Federal Seed Act and is at least equal to requirements specified. This certification shall be obtained from the vendor and shall be furnished on or with all copies of seed invoices.

SD-18 Records

Signed, certified copies of the following reports shall be submitted.

Fertilizer Invoices; FIO.

Invoices obtained from the vendor shall indicate quantities and grade of each fertilizer furnished.

Seed Invoices; FIO.

Invoices shall be obtained from the vendor.

Official Seed Analysis or Official Seed Tags; FIO.

Obtained from the vendor. The official seed analysis or the official seed tags shall be furnished with all copies of the seed invoices.

Notification of Sources; GA.

The Contractor shall notify the Contracting Officer for approval, in writing, the sources from which the following materials will be furnished:

Sod

Mulch

1.3 INSPECTION AND TESTS

1.3.1 Fertilizer

Samples of each lot of fertilizer shall be tested by the Contractor upon request of the Contracting Officer. Sampling and testing shall be in accordance with the AOAC Official Methods of Analysis, at the discretion of Contracting Officer. The empty fertilizer bags shall be retained, and upon completion of the project, a final check of total quantities of fertilizer used will be made against the total area treated. If minimum rates of application have not been met, additional quantities of these materials to make up minimum application specified shall be distributed as directed.

1.3.2 Seed

Each lot of seed may be sampled and tested, in accordance with latest USDA Rules and Regulations under the Federal Seed Act, at the discretion of the Contracting Officer. Such sampling and testing shall be made by or under the supervision of the Government. If these tests reveal the seed to be below the specified pure live seed content, the Contractor shall be required to plant additional seed to compensate for the deficiency at no additional cost to the Government. The seed test will be conducted by the State Seed Laboratory. Allowance will be made for the actual pure live seed content of grasses in determining the actual planting rate.

1.3.3 Sod

Not less than five days prior to commencement of sodding operations the Contracting Officer shall be notified of the off-site sources from which sod is to be furnished. Sod shall be inspected prior to and during laying operations; sod that fails to meet requirements shall be rejected. Rejected material, if suitable, may be pulverized and used for filling. The average thickness of the sod will be determined at the sodding site as follows: 11 random sods will be stacked on a flat surface; the thickness from the base of the bottom sod to the base of the top sod will be measured, and that thickness divided by 10.

1.3.4 Mulch

Not less than five days prior to commencement of mulching operations the Contracting Officer shall be notified of sources from which mulch materials are available and the quantities thereof. Representative samples of the material proposed for use shall be submitted for approval. A weight certificate signed by a public weigher shall be furnished for each load of mulch used on the site. The weight certificates shall be furnished prior to applying the mulch. The mulch material shall be unloaded and stacked in an orderly manner.

1.3.5 Soil for Repairs

Not less than five days prior to the commencement of repair work, the Contracting Officer shall be notified of the source from which soil for repairs is to be furnished. The material will be inspected to determine whether the selected soil meets the requirements. The soil shall be subject to approval prior to use.

1.4 PAYMENT

No payment or partial payment will be made for work covered by this section of the specifications until all portions of this section, including maintenance of turfing work, are adequately performed and accepted, as determined by the Contracting Officer.

1.5 DELIVERY AND STORAGE

1.5.1 Delivery

1.5.1.1 Fertilizer

Fertilizer shall be delivered to the site in original, unopened bags or other convenient containers, each fully labeled, conforming to the applicable State fertilizer laws, and bearing the name, trade name or trademark, and warranty of the producer. In lieu of bags or containers, fertilizer may be furnished in bulk. Bulk deliveries shall be accompanied by a certificate conforming to PART 1 paragraph SUBMITTALS, SD-13 Certificates.

1.5.1.2 Seed

Seed shall be furnished in sealed, standard containers unless written exception is granted.

1.5.2 Storage

1.5.2.1 Storage Area

Materials shall be stored in areas designated by the Contracting Officer.

1.5.2.2 Seed and Fertilizer

Seed and fertilizer shall be stored in dry locations away from contaminants.

1.5.2.3 Sod

Sod shall be lightly sprinkled with water, covered with moist burlap, straw or other covering; and protected from exposure to wind and direct sunlight until planted. Covering shall be provided that will allow air to circulate and prevent internal heat from building up.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Fertilizer

Fertilizer shall be controlled release commercial grade, free flowing, uniform in composition and conforming to CID A-A-1909. Granular Fertilizer: Consists of nitrogen-phosphorus-potassium ratio: 15 percent nitrogen, 5 percent phosphorus, and 10 percent potassium. The fertilizer

shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.1.2 Seed

Seed labeled in accordance with USDA Rules and Regulations under the Federal Seed Act shall be furnished. Seed that is wet or moldy or that has been otherwise damaged in transit or storage will not be acceptable. The seed shall be free of field bindweed, hedgeweed, and nutgrass seed. Seed shall not contain other noxious weed seed in excess of the limits allowable under the Federal Seed Act and applicable State seed laws. Seed labeled as mixture or pasture mixture will not be acceptable. Common Bermudagrass seed shall not contain in excess of three percent of giant strains of Bermudagrass. Each seed container shall bear the date of the last germination which date shall be within a period of 6 months prior to commencement of planting operations.

2.1.2.1 Seed Mixture

Seed with the following percentage by weight of pure live seed in each lot shall be furnished. Weed seed shall not exceed one percent.

(AM#0002)

| Kind of Seed | | Kilograms of Pure Live Seed | Hulled or Unhulled |
|---|---|---|---|
| Common Name | Scientific Name | | |
| Common Bermuda | Cynodon dactylon | 57 kg./ha. | Hulled |
| Buffalo Grass | Buchloe dactyloides | 68 kg./ha. | Unhulled and treated |

NOTE: $\frac{\%\ \text{Purity times (\% Germination plus \% hard or dormant seed)}}{100}$ = %pure live seed

2.1.3 Sod

Sod containing a dense cover of growing or living grass shall be provided. Living grass is defined as grass that is seasonably dormant during a cold or dry season and capable of renewing growth after the dormant period. At least 90 percent of the plants in the sod shall be common Bermudagrass. Sod shall be procured from areas having growing conditions similar to those areas on which the sod is to be used. Sod shall be furnished that is free of noxious weeds and undesirable plants, stones, roots of trees, and other materials that hinder the development and maintenance of sod. Vegetation more than three inches in height shall be cut to two inches or less, and hay and other loose materials on the surface shall be removed at least 5 days before the sod is lifted. Sod shall be procured from areas containing clay or clay loam topsoil. Sod shall have such density that when it is cut in strips 305 mm wide, it can be lifted and handled without breaking. When the sod is cut, the height of the grass shall not exceed 50 mm . Sod shall be cut with an approved sod cutter to provide an average thickness of 38 mm . All sod shall be furnished by the Contractor from approved sources off the site.

2.1.4 Water

Water shall be free from oil, acid, alkali, salt, and other substances harmful to growth of grass, and shall be from a source approved prior to use.

2.1.5 Mulch

Acceptable mulch shall be baled, bright, native prairie hay, such as broomsedge bluestem, little bluestem, big bluestem, switchgrass, and indiangrass, or hay of other grasses and sedges having the equivalent in leafiness, structure and fibre strength. Bermudagrass hay, cereal grain straw (such as oat and wheat), and forage sorghums, including johnsongrass, will not be acceptable. Hay material which has passed through a seed harvesting combine or a thresher will not be acceptable. A minimum of 50 percent of weight of the herbage making up the material shall be 250 mm in length or longer. Mulch material which contains an excessive quantity of mature seed of noxious weeds or other species, including crops which would be detrimental to the grasses planted on the mulched areas or provide a menace to surrounding farm lands, will not be acceptable. Discolored, weathered, brittle hay or any hay harvested during the dormant season will not be acceptable.

2.1.6 Topsoil

Reference SECTION 02920 TOPSOILING.

PART 3 EXECUTION

3.1 GENERAL

The turfing work shall be accomplished only when satisfactory results can be expected during periods indicated in PART 3 paragraph PLANTING SEASON. When conditions such as drought, excessive moisture, high winds, or other factors prevail to such an extent that satisfactory results are not likely to be obtained, the Contracting Officer may, at his own discretion, stop any phase of the work. The work shall be resumed only when, in the opinion of the Contracting Officer, the desired results are likely to be obtained. All turfing operations shall be conducted across the slope. Establishment of turf shall be accomplished on all unpaved, graded, and disturbed areas that are the result of the Contractor's operations and as specified herein. Hydromulching will not be accepted.

3.2 PLANTING SEASON

The planting season for turfing work shall be from 1 April to 1 June; planting shall be accomplished during the first planting season, or portion thereof (but not less than 15 days), following substantial completion of building construction. Turfing work for all phases of this contract shall be accomplished within that period.

3.3 REPAIR WORK

Repair work shall be done on the slopes of areas where gullies have occurred, as required by the Contracting Officer. The entire fill in gullies shall be compacted by the tractor wheels as the soil is placed and spread. Repairs shall be accomplished on slopes damaged prior to or during accomplishment of turfing work. The damaged slopes shall be repaired to re-establish the condition and grade of the soil prior to the damage as directed by the Contracting Officer. Repair work shall be done to the extent and at the locations directed by the Contracting Officer. Repair work shall be done before fertilizing operations are begun. Reseeding shall be accomplished on previously seeded areas after repairs are completed.

3.4 SMOOTHING

Smoothing shall be done on areas to receive turfing as directed by the Contracting Officer. Smoothing shall be done on gullied areas, where grades cannot be restored and gullies filled by the specified tillage operations. Smoothing shall be done, where required, to facilitate seeding operations. Smoothing shall be done with a bulldozer, maintainer or other approved blade equipment.

3.5 APPLICATION OF FERTILIZER

Fertilizer shall not be applied more than 24 hours in advance of tilling operations. The fertilizer distributor box shall be equipped with baffle plates to prevent downward movement of fertilizer when operating on the slope. Fertilizer shall be distributed with a fertilizer distributor (Ezee Flow) or approved equal at the rate of 340 kilograms per hectare.

3.5.1 Refertilizing

The planted areas shall be refertilized 5 weeks after commencement of maintenance operations, with refertilizing completed not later than 3 days after commencement. Fertilizer shall be applied at the rate of 300 kg per hectare . Fertilizer shall be applied when the vegetation is dry. The refertilized areas shall be watered as specified for MAINTENANCE OF TURFING WORK within 24 hours following refertilizing operations.

3.6 PREPARATION OF GROUND SURFACE

Equipment, in good condition, shall be provided for the proper preparation of the ground. Equipment shall be subject to approval before work is started.

3.6.1 Clearing

Prior to grading and tilling, vegetation that may interfere with operations shall be mowed, grubbed, and raked. The collected material shall be removed from the site. The surface shall be cleared of stumps, and stones larger than 2 mm in diameter, and roots, cable, wire, and other materials

that might hinder the work or subsequent maintenance shall also be removed.

3.6.2 Grading

Previously established grades shall be maintained on the areas to be treated in a true and even condition, and necessary repairs shall be made to previously graded areas. All surfaces shall be left in a smooth condition to prevent formation of depressions. Areas having inadequate drainage as indicated by the ponding of water near foundations, walks, driveways, or on other areas shall be filled or graded to drain as directed by the Contracting Officer. Ruts, deep tracks, dead furrows, and ridges shall be eliminated and the necessary replanting accomplished prior to acceptance of the completed work. Replanting shall be at the same rate and same manner as specified for the original planting. The finished grade shall be such that after the various turfing operations, the planted grade will be one inch below the adjacent surfaced grade of walks, drives, and curbs.

3.6.3 Tillage

After the areas have been brought to the grades shown, tillage shall be accomplished in such manner as to destroy existing vegetation and to prepare an acceptable seed bed. The Contractor shall utilize tractors with adequate horsepower and heavy duty tillage equipment in accomplishing the specified tillage operations. All areas shall be tilled with a heavy duty disk type breaking plow or chisel type breaking plow, followed by disking with a disk harrow, and smoothing with a weighted spike tooth harrow, railroad irons, or bridge timber float drag. When a chisel plow is used the chisels shall be set not to exceed 250 mm apart, and the areas shall be cross or double tilled. Lawn areas shall be left smooth for lawn purposes and other areas shall be left smooth for ease of mowing. Depth of tillage shall be 100 mm.

3.7 SODDING

3.7.1 Obtaining and Handling Sod

After inspection and approval of the source of sod, the sod shall be cut into squares or rectangular sections, exercising care to retain the native soil on the roots of the sod during stripping, transporting, and planting. Sod shall be transplanted within 24 hours after the sod is stripped, unless stored in a satisfactory manner. If sod is stacked it shall be placed roots to roots or grass to grass. Sod shall be kept moist during delivery and while in stacks. Sod shall be protected from exposure to wind and sun and from freezing. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Rectangular sections of sod may vary in length but shall be of equal width and of a size that permits the sod to be lifted and rolled without breaking. Sod shall not be dumped from vehicles. When soil is too dry, permission to cut sod will be granted only after the ground has been watered sufficiently to moisten the ground to the depth to which sod is to be cut. Damaged sod will be rejected. The sod shall be cut with an approved sod cutter.

3.7.2 Placing Sod

When authorized in writing, sodding may be performed during dry weather or periods of drought, provided the ground is watered sufficiently to moisten soil adequately to depth to which sod is to be cut and sod bed is thoroughly watered to a depth of at least 100 mm prior to placing sod.

3.7.2.1 Solid Sodding

The areas to be solid sodded shall be excavated to a sufficient depth so that the top of the sod when set in place will be from 13 mm to 25 mm below the surrounding soil at the outer edges of the solid sodded area. Sod shall be laid smooth, edge to edge, with staggered joints. Sod shall be immediately pressed firmly into contact with the sod bed by hand tamping with an approved hand tamper to eliminate air pockets. A true and even surface shall be provided, to insure knitting without displacement of the sod or deformation of the surfaces of the sodded areas. Following compaction, screened soil of good quality shall be used to fill all cracks, and excess soil shall be worked into the grass with rakes or other suitable equipment. Grass shall not be smothered with excess fill soil.

3.8 PLANTING SEED

The Contractor shall conduct seeding equipment calibration tests in the presence of the Contracting Officer as a means of determining the equipment setting to plant the seed at the specified rates. If unplanted skips and areas are noted after germination and growth of the grass, the Contractor shall be required to seed the unplanted areas with the grass or grasses that were to have been planted at no additional cost to the Government. Seed boxes shall be kept at least half full during seeding operations to insure even distribution of seed over all the areas seeded. Seeding equipment operating on slopes shall be anchored, as required, to prevent downward movement of the equipment and formation of ridges and ruts.

3.8.1 Seeding

The equipment to be used and the methods of planting shall be subject to the inspection and approval of the Contracting Officer prior to commencement of planting operations. The seed shall be planted at the rates indicated in paragraph SEED MIXTURE.
The seed shall be planted using a Brillion seeder or approved equal. Depth of planting the seed shall be 13 mm. The seed shall be planted prior to the initial watering.

3.9 PROTECTION

The seeded areas shall be protected against traffic or other use by erecting barricades immediately after seeding is completed and by placing warning signs of a type approved by the Contracting Officer on the various areas. Such protective devices shall be maintained until completion of all work under this contract.

## 3.10 MULCHING AREAS

### 3.10.1 Applying Mulch

Mulch shall be spread uniformly in a continuous blanket, using 3 metric tons per hectare. Mulch shall be spread by hand or by an approved blower-type mulch spreader. Blower-type mulch spreaders shall be adjusted and operated in such manner to prevent excessive breakage of the mulch material. If this cannot be accomplished, the mulch shall be spread by hand. Care shall be exercised to insure that all wire from baled hay is collected as it is removed from the bale and then removed from the site. Mulching shall be started at the windward side of relatively flat areas, or at the upper part of a steep slope, and continued uniformly until the area is covered. The mulch shall not be bunched.

#### 3.10.1.1 Mulching Prior to Planting

(AM#0002)When construction activities cease for periods greater than 14 days, or when there are contract delays in the turfing operation and a quick cover is required to prevent erosion, or when seasonal conditions preclude immediate permanaent stabilization measures, the Contractor shall provide temporary soil stabilization for all unpaved, graded and disturbed portions of the site as soon as practicable. During periods when turfing not approved in PART 3 paragraph PLANTING SEASON, hay mulch shall be applied at the rate of 3 metric tons per hectare following tilling. Hay mulch will then be anchored.

#### 3.10.1.2 Mulching After Planting

Hay mulch shall be applied to seeded areas after tilling, fertilizing, tilling, and seeding during period when seeding is approved in PART 3 paragraph PLANTING SEASON.

### 3.10.2 Anchoring Mulch

Within 4 hours following spreading, the mulch shall be anchored in the soil to a depth of 50 mm to 76 mm . An approved machine equal to a disk harrow with cupped disks removed and replaced with straight rolling coulters spaced not more than eight inches apart and having edges approximately 3 mm wide shall be used to anchor the mulch. The machine shall be weighted and operated in such manner to secure the hay firmly in the ground to form a soil-binding mulch and prevent loss or bunching of the hay by wind. The mulch anchoring machine shall be as manufactured by the Finn Equipment Co. of Cincinnati, Ohio, or approved equal. The mulch machine shall be anchored as required to prevent downward movement of the equipment and the formation of ridges and ruts. Suitable anchoring equipment shall be on hand and ready for use prior to applying the mulch. The coulters shall be at least 250 mm in diameter. The number of passes needed, not to exceed 3, will be determined by the Contracting Officer.

### 3.10.3 Maintenance of Mulched Areas

Mulch shall be maintained until all work or designated portions thereof have been completed and accepted. Maintenance shall consist of providing

protection against traffic by erecting barricades and placing warning signs as specified in PART 3 paragraph PLANTING SEED. Any damage shall be repaired, and mulch material that has been removed by wind or other causes shall be replaced and secured.

3.11 WATERING AREAS

3.11.1 Initial Watering

(AM#0002)Water shall be applied to the sodded and seeded areas. Such watering shall be within 12 hours after commencement of turfing operations on each portion of an area to be planted. If the soil is extremely dry prior to planting, watering of the areas 48 to 72 hours in advance of planting may be required if deemed necessary by the Contracting Officer. Water shall be applied using portable aluminum pipelines with rotating sprinklers. The sprinklers shall not be spaced in excess of 40 feet apart. Small areas which are inaccessible with portable aluminum pipelines will be watered with hoses and rotating sprinklers. Water shall be applied to the planted areas at a rate sufficient to insure thorough wetting of the soil to a depth of 100 mm over the entire planted area. The actual rate will be determined by the Contracting Officer at the time of watering. Watering operations shall be discontinued during and following effective rains and resumed as directed by the Contracting Officer. Watering operations shall be properly supervised to prevent run-off of water. The Contractor shall supply all pumps, hoses, pipelines and sprinkling equipment. The Contractor shall have adequate equipment available for watering operations prior to commencement of planting operations. The Contractor shall repair areas damaged by watering operations at no cost to the Government. All water shall be kept free from oil, acids, alkali, salts, and other substances harmful to the growth of grass.

3.11.2 Rewatering

On each area specified to be watered, rewaterings shall be required after the initial watering. Rewatering shall be at the same rate and applied in the same manner as specified for the initial watering. Rewaterings shall be required during the entire maintenance period.

3.12 MAINTENANCE OF TURFING WORK

3.12.1 General

(AM#0002)The Contractor shall maintain all seeded and sodded areas during the planting period and for an additional period of not less than 90 calendar days following completion of planting operations or replanting operations, if required. Maintenance shall consist of watering, replanting, mowing, maintaining existing grades, and repair of erosion damage.

3.12.2 Stand

A stand shall be defined as the planted area achieving a uniform live grass coverage having a density where the total bare spots do not exceed 2 percent of the total turfed area, bare spots are not larger than 150 mm

square, and the grass is of a height sufficient to be capable of being mowed as specified in the mowing requirements contained in this contract.

3.12.3 Replanting

Bermudagrass seed should germinate within at least 14 days from planting. If, after that 14-day period a successful germination of a potential stand of grass is not present, the area shall be reseeded prior to the end of the planting season, or within the next 7 days after the 14-day germination period if after the plant season as specified in PART 3 paragraph PLANTING SEASON.

3.12.4 Maintenance of Grades and Repair of Erosion Damage

It shall be the responsibility of the Contractor to maintain the original grades of the planted turf areas after commencement of planting operations and during the specified maintenance period. Any damage to the finished surface from Contractor's operations shall be promptly repaired. In the event erosion occurs from either watering operations or from rainfall, such damage shall be repaired within 10 days from the date of the noted damage. Ruts, ridges, tracks, and other surface irregularities shall be corrected and replanted where required prior to acceptance.

3.12.5 Mowing

Mowings of all planted areas shall be accomplished on all planted areas when the soil is dry and when deemed necessary by the Contracting Officer. The exact time of the mowing will be determined by the Contracting Officer. Mowing of the vegetation shall be to a height of 100 mm to 150 mm and shall be accomplished with a rotary type mower. The clippings shall be left evenly distributed over all the mowed areas. Mowing shall be conducted in such a manner as not to cause damage to slopes. Mowing shall be completed prior to the end of the maintenance period.

3.13 WATERING

(AM#0002)Maintenance watering shall consist of daily watering. Water shall be applied each day over the entire planted area until the soil is thoroughly wet to a depth of 100 mm as determined by the Contracting Officer. During and following effective rainfall, watering shall be discontinued but shall be promptly resumed when directed by the Contracting Officer. Water shall be applied using portable aluminum lines with rotating sprinklers. Spacing of the sprinklers shall not exceed 12 meters along the aluminum lines. Hoses with rotating sprinklers may be used for watering the smaller areas adjacent to the building.

3.14 WATERING

3.14.1 Watering

(AM#0002)Water shall be applied within 12 hours after commencement of the seeding and sodding operations and following rolling or compaction of the designated areas. Rolling or compaction of the area shall be accomplished using a smooth surface steel roller or Brillion seeder or approved equal.

Water shall be applied, after completion of seeding, rolling or compacting. Water shall be applied at a rate to thoroughly wet the soil to a depth of 100 mm over the entire planted area. The actual rate at which water is to be applied shall be determined by the Contracting Officer at the time of watering. Watering shall be conducted in such manner to prevent run-off of water. All damage resulting from watering operations shall be repaired by the Contractor at no expense to the Government. The Contractor shall supply all pumps, trucks, hoses, pipelines and other watering equipment. Water trucks shall not be operated on the seeded areas.

-- End of Section --

SECTION 02940

# MULCHING FOR EROSION CONTROL
08/2000
**AMENDMENT 0002**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ASSOCIATION OF OFFICIAL ANALYTICAL CHEMISTS (AOAC)

AOAC-01 Official Methods of Analysis

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-1909 (Basic; Notice 1) Fertilizer

### 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Schedules

Construction Equipment List; FIO.

Prior to mulching operations, the Contractor shall furnish lists and descriptive data of the types of equipment the Contractor proposes to use in mulching operations such as for preparation of ground surface, smoothing, fertilizing, mulching, and anchoring machines for mulch.

SD-09, Reports

Fertilizer; FIO.

Test reports of samples of fertilizer shall be signed and certified by the testing laboratory. Testing laboratories used by the Contractor shall be approved by the Contracting Officer.

SD-13 Certificates

Fertilizer; FIO.

Bulk deliveries of fertilizer shall be accompanied by a certificate indicating net pounds furnished, chemical analysis, name, trade name, and warranty of the supplier of the fertilizer.

SD-18 Records

Signed, certified copies of the following reports shall be submitted.

Fertilizer; FIO.

Invoices shall indicate quantities and grade of each fertilizer furnished.

Notification of Sources; FIO.

The Contractor shall notify the Contracting Officer for approval, in writing, the sources from which the following materials will be furnished:

Mulch

## 1.3 INSPECTION AND TESTS

### 1.3.1 Fertilizer

Samples of each lot of fertilizer shall be tested by the Contractor upon request of the Contracting Officer. Sampling and testing shall be in accordance with the AOAC-01, at the discretion of Contracting Officer. The empty fertilizer bags shall be retained, and upon completion of the project, a final check of total quantities of fertilizer used will be made against the total area treated. If minimum rates of application have not been met, additional quantities of these materials to make up minimum application specified shall be distributed as directed.

### 1.3.2 Mulch

Not less than 5 days prior to commencement of mulching operations the Contracting Officer shall be notified of sources from which mulch materials are available and the quantities thereof. Representative samples of the material proposed for used shall be submitted for approval. A weight certificate signed by a public weigher shall be furnished for each load of mulch used on the site. The weight certificates shall be furnished prior to applying the mulch. The mulch material shall be unloaded and stacked in an orderly manner.

## 1.4 DELIVERY AND STORAGE

### 1.4.1 Delivery

#### 1.4.1.1 Fertilizer

Fertilizer shall be delivered to the site in original, unopened bags or other convenient containers, each fully labeled, conforming to the applicable State fertilizer laws, and bearing the name, trade name or trademark, and warranty of the producer. In lieu of bags or containers,

fertilizer may be furnished in bulk. Bulk deliveries shall be accompanied by a certificate giving net pounds furnished, chemical analysis, name, trade name, and warranty of the supplier of the fertilizer.

1.4.2 Storage

1.4.2.1 Storage Area

Materials shall be stored in areas approved by the Contracting Officer.

1.4.2.2 Fertilizer

Fertilizer shall be stored in cool, dry locations away from contaminants.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Fertilizer for Fertilizing

Fertilizer shall be controlled release commercial grade, free flowing, uniform in composition and conforming to CID A-A-1909. Consists of nitrogen-phosphorus-potassium ratio: 15 percent nitrogen, 5 percent phosphorus, and 10 percent potassium. The fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.1.2 Mulch

Acceptable mulch shall be baled, bright, native prairie hay, such as broomsedge bluestem, little bluestem, big bluestem, switchgrass, and indiangrass, or hay of other grasses or sedges having the equivalent in leafiness, strength and fibre strength. Bermudagrass hay, cereal grain straw (such as oat and wheat), and forage sorghums, including Johnson grass, will not be accepted. Hay material which has passed through a seed harvesting combine or a thresher will not be acceptable. A minimum of 50 percent of weight of the herbage making up the material shall be 250 mm in length or longer. Mulch material which contains an excessive quantity of mature seed of noxious weeds or other species, including crops which would be detrimental to the grasses planted on the mulched areas or provide a menace to surrounding farm lands, will not be acceptable. Discolored, weathered, brittle hay or any hay harvested during the dormant season will not be acceptable.

PART 3 EXECUTION

3.1 GENERAL

When construction activities cease for periods greater than 14 days, or when there are contract delays in the turfing operation and a quick cover is required to prevent erosion, or when seasonal conditions preclude immediate permanaent stabilization measures, the Contractor shall provide temporary soil stabilization for all unpaved, graded and disturbed portions

of the site as soon as practicable. The mulching work shall be accomplished only when satisfactory results can be expected. When conditions such as drought, excessive moisture, high winds, or other factors prevail to such an extent that satisfactory results are not likely to be obtained the Contracting Officer may, at his own discretion, stop any phase of the work. The work shall be resumed only when, in the opinion of the Contracting Officer, the desired results are likely to be obtained. All mulching operations shall be conducted across the slope. Mulching shall be accomplished as indicated on the drawings and as specified herein.

3.2 PLANTING SEASON

The planting season for turfing work shall be from 1 April to 1 June; planting shall be accomplished during the first planting season, or portion thereof (but not less than 15 days), following substantial completion of building construction. Turfing work for all phases of this contract shall be accomplished within that period.

3.3 REPAIR WORK

Repair work shall be done on the slopes of areas where gullies have occurred, as required by the Contracting Officer. The entire fill in gullies shall be compacted by the tractor wheels as the soil is placed and spread. Repairs shall be accomplished on slopes damaged prior to or during accomplishment of mulching work. The damaged slopes shall be repaired to re-establish the condition and grade of the soil prior to the damage as directed by the Contracting Officer. Repair work shall be done to the extent and at the locations directed by the Contracting Officer. Repair work shall be done before fertilizing and mulching operations are begun. Soil for repairs shall be obtained from approved sources within project limits.

3.4 SMOOTHING

Smoothing shall be done as directed by the Contracting Officer. Smoothing shall be done on gullied areas, where grades cannot be restored and gullies filled by the specified tillage operations. Smoothing shall be done, where required, to facilitate mulching operations. Smoothing shall be done with a bulldozer, maintainer or other approved blade equipment.

3.5 APPLICATION OF FERTILIZER

Fertilizer shall not be applied more than 24 hours in advance of tilling operations. The fertilizer distributor box shall be equipped with baffle plates to prevent downward movement of fertilizer when operating on the slope. Fertilizer shall be distributed with a fertilizer distributor (Ezee Flow) or approved equal at the rate and in the manner specified hereinafter.

Application Rate: Fertilizer shall be uniformly distributed at the rate of 180 kg of 15-5-10 per hectare prior to tilling.

3.6 PREPARATION OF GROUND SURFACE

Equipment, in good condition, shall be provided for the proper preparation of the ground. Equipment shall be subject to approval before work is started.

3.6.1 Clearing

Prior to grading and tilling, vegetation that may interfere with operations shall be mowed, grubbed, and raked. The collected material shall be removed from the site. The surface shall be cleared of stumps, and stones larger than 76 mm in diameter, and roots, cable, wire, and other materials that might hinder the work or subsequent maintenance shall also be removed.

3.6.2 Grading Repair

Previously established grades shall be maintained on the areas to be treated in a true and even condition, and necessary repairs shall be made to previously graded areas. All surfaces shall be left in a smooth condition to prevent formation of depressions. Ruts, deep tracks, dead furrows, and ridges shall be eliminated and the necessary replanting accomplished prior to acceptance of the completed work.

3.6.3 Tillage

After the areas have been brought to the grades shown, tillage shall be accomplished in such manner as to destroy existing vegetation and to prepare an acceptable mulch bed. The Contractor shall utilize tractors with adequate horsepower and heavy duty tillage equipment in accomplishing the specified tillage operations. All areas shall be tilled with a heavy duty disk or chisel type breaking plow followed by disking with a disk harrow, and smoothing with a weighted spike tooth harrow, railroad irons, or bridge timber float drag. When a chisel plow is used the chisels shall be set not to exceed 250 mm apart, and the areas shall be cross or double tilled. Depth of tillage shall be 100 mm .

3.7 MULCHING

3.7.1 Applying Mulch

Mulch shall be spread uniformly in a continuous blanket, using 3.18 metric tons per hectare . Mulch shall be spread by hand or by an approved blower-type mulch spreader. Blower-type mulch spreaders shall be adjusted and operated in such manner to prevent excessive breakage of the mulch material. If this cannot be accomplished, the mulch shall be spread by hand. Care shall be exercised to insure that all wire from baled hay is collected as it is removed from the bale and then removed from the site. Mulching shall be started at the windward side of relatively flat areas, or at the upper part of a steep slope, and continued uniformly until the area is covered. The mulch shall not be bunched.

3.7.1.1 Mulching Prior to Planting

During periods when turfing is not approved in in PART 3 paragraph PLANTING SEASON, hay mulch shall be applied at the rate of 3.18 metric tons per

hectare following fertilizing and tilling. Hay mulch will then be anchored.

3.7.2 Anchoring Mulch

Immediately following spreading, the mulch shall be anchored in the soil to a depth of 50 mm to 76 mm . An approved machine equal to a disk harrow with cupped disks removed and replaced with straight rolling coulters spaced not more than 203 mm apart and having edges approximately 3.2 mm wide shall be used to anchor the mulch. The machine shall be weighted and operated in such manner to secure the hay firmly in the ground to form a soil-binding mulch and prevent loss or bunching of the hay by wind. The mulch anchoring machine shall be as manufactured by the Finn Equipment Co. of Cincinnati, Ohio, or approved equal. The mulch machine shall be anchored as required to prevent downward movement of the equipment and the formation of ridges and ruts. Suitable anchoring equipment shall be on hand and ready for use prior to applying the mulch. The coulters shall be at least 250 mm in diameter. Mulch shall be secured within 24 hours after spreading of mulch. The number of passes needed, not to exceed three, will be determined by the Contracting Officer.

3.7.3 Maintenance of Mulched Areas

Mulch shall be maintained until Commencement of turfing operations, then mulch shall be incorporated into the topsoil following fertilizing and during preparation of ground surface for planting operations. Maintenance shall consist of providing protection against traffic by erecting barricades and placing warning signs. Any damage shall be repaired, and mulch material that has been removed by wind or other causes shall be replaced and secured.

-- End of Section --

SECTION 02961

PLANTING OF TREES, SHRUBS, AND VINES

**08/2000**
**AMENDMENT 0002**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z60.1 (1990) Nursery Stock

AMERICAN JOINT COMMITTEE ON HORTICULTURAL NOMENCLATURE (AJCHN)

AJCHN-01 (1942, 2nd Ed.) Standard Plant Names

ASSOCIATION OF OFFICIAL ANALYTICAL CHEMISTS (AOAC)

AOAC-01 Official Methods of Analysis

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-1909 (Basic; Notice 1) Fertilizer

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09 Reports

Mulch; FIO.

Certified copies of the analysis of each type of mulch used in the project, made by an approved, independent, recognized laboratory in accordance with the current method of the AOAC-01. Testing shall be at the Contractor's expense. Testing shall be submitted for approval of the Contracting Officer before delivery of the peat.

SD-13 Certificates

The certificates listed below shall be submitted for approval prior to

commencement of work:

Fertilizer; FIO.

One certificate for each type to be used in the project.

Soil Amendments; FIO.

Certificates for each type of soil amendment to be used on the project.

Recycled Compost; FIO.

Prior to delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include composition, source, and treatment against fungi growth.

Woodbark Mulch; FIO.

Certificates shall list all information on the container label and the amounts of each type to be used on the project.

SD-18 Records

Plant Material; FIO.

All necessary inspection certificates shall accompany the invoice for each shipment or order of stock, as may be required by law for the necessary transportation, and such certificates shall be filed with the Contracting Officer prior to acceptance of the materials.

## 1.3 INSPECTION

### 1.3.1 Plant Materials

All shipments or orders of plant material shall be properly inspected at the nursery or at the growing site by the authorized Federal and State authorities.

### 1.3.2 Topsoil

Off base sources of topsoil shall be inspected to determine the acceptability of the topsoil, including the maximum depth to which it is to be stripped.

## 1.4 DIGGING UP, WRAPPING, HANDLING, DELIVERY AND STORAGE

Plants shall be dug and prepared for shipment in a manner that will not cause any damage to the branches, shape, root system, and future development of the plants after replanting. Plants shall not be handled by the trunk or stems. The use of equipment such as "tree spades" will be permitted provided that the plant balls are sized in accordance with ANSI Z60.1 and top are protected from damage. Damaged plants will be rejected and shall be removed from the site.

1.4.1 Balled and Burlapped Plants

Balled and burlapped plants, designated B&B in the list of required plants, shall be adequately balled with firm natural balls of soil in sizes as shown on the drawings. Balls shall be firmly wrapped with burlap or substitute approved cloth. No balled plant shall be planted if the ball is cracked, mushy, or broken, or if the stem is loose in the ball, either before or during the process of planting. Balled plants shall be lifted and handled from the bottom of the ball.

1.4.2 Container-Grown Plants

Container-grown plants are designated with the letter "C" in the list of required plants. Plants shall have sufficient roots to hold earth together intact after removal from containers without being rootbound.

1.4.3 Options as to Methods

If all other requirements are met, any plant other than trees (unless otherwise indicated on the drawings) may be furnished container-grown instead of balled and burlapped. Any substitutions shall be made only with approval of the Contracting Officer at no change in the contract price.

1.4.4 Shipment and Delivery

The Contractor shall promptly notify the Contracting Officer, in advance, when the plant material will be delivered and the manner of shipment. The Contractor shall furnish an itemized list, in duplicate, of the actual quantity of plant material in each delivery, in order to insure satisfactory coordination of delivery and to expedite the required inspection at the point of delivery. The itemized list of the plant material for each delivery shall include the pertinent data as specified in the list of required plants. This list and the necessary inspection certificates to accompany each plant or shipment shall be delivered to the Contracting Officer, prior to acceptance and planting of the plant material.

1.4.4.1 Protection During Delivery

Plants shall be protected during delivery to prevent damage to the root balls or desiccation of leaves. Trees shall be protected during transportation by tying in the branches and covering all exposed branches. When shipment is made by truck, all plant material shall be packed to provide adequate protection against climatic, seasonal, and breakage injuries during transit. The tops shall be securely covered with tarpaulin or canvas to minimize wind-whipping and drying. When shipment is made by rail, box cars shall be carefully packed and adequately ventilated to prevent sweating of the plants during transit. Shipments made by rail to local or nearby freight yards shall be given special attention to insure prompt delivery and careful handling therefrom to the point of final delivery at the planting jobsite. Under no circumstances shall balled plants be dropped from box cars or trucks to the ground. A suitable method of handling shall be employed to preclude cracked or mushroomed plant balls

at the point of delivery.

1.4.4.2 Inspection Upon Arrival

Plant material shall be inspected upon arrival at the jobsite. Unacceptable plant material shall be removed from the jobsite.

1.4.4.3 Commercial Fertilizer

Commercial fertilizer shall be delivered to the site in unopened original containers, each fully labeled, conforming to the applicable State fertilizer laws and bearing the trade name or trademark and warranty of the producer. Each sack shall bear the manufacturer's statement of analysis, indicating the percentages of available nitrogen, available phosphoric acid, and potash.

1.4.4.4 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's guaranteed chemical analysis and name. In lieu of containers, soil amendments may be furnished in bulk and a certificate from the manufacturer indicating the above information shall accompany each delivery.

1.4.4.5 Mulch

Mulch shall be delivered to the jobsite in unopened bags or in unopened containers and shall be fully labeled.

1.4.5 Protection Against Freezing and Drying Out

1.4.5.1 Plant Storage

Care shall be taken to avoid drying or damaging plants being moved from the nursery or storage area to the planting site. All plants shall be handled so that roots are adequately protected at all times from drying out and from other injury. Balled and burlapped plants shall be handled carefully to avoid cracking or breaking the earth ball. The rootballs of vegetation that cannot be planted immediately on delivery shall be well protected with soil or other acceptable material. The Contractor shall safeguard the unplanted plants during freezing weather by inside storage and other precautionary measures.

1.4.5.2 Storage of Other Materials

Soil amendments shall be kept in dry storage away from contaminants. Storage of materials shall be in areas designated or as approved by the Contracting Officer.

1.5 WARRANTY

Furnished plant material shall have a warranty for plant growth to be in a vigorous growing condition for a minimum 12 month period. A minimum 12 month calendar time period for the warranty of plant growth shall be

provided regardless of the contract time period. When plant material is determined to be unhealthy in accordance with paragraph PLANT ESTABLISHMENT PERIOD, it shall be replaced under this warranty.

## PART 2 PRODUCTS

### 2.1 PLANTS REQUIRED

The species (scientific and common names), size, and manner in which to be furnished, are given in the plant list shown on the drawings.

#### 2.1.1 Substitutions

Plants of kinds other than those named in plant list will not be accepted unless specifically approved in writing by the Contracting Officer. Proposed substitutes, in each case, must possess the same essential characteristics as the kind of plant actually specified in regard to appearance, ultimate height, shape, habit of growth, general soil and other requirements. In no case shall the average cost and value of substituted plants be less than the cost and value of plants actually specified. Plants of greater value may be accepted without additional cost to the Government.

### 2.2 PLANT MATERIALS

All plant material furnished shall be nursery-grown, well branched, full-foliaged, and well proportioned, particularly with respect to the width-height relationship, and shall have a fibrous root system. The Government may inspect plants at place of growth, but such inspection shall not preclude the right of rejection at the site.

#### 2.2.1 Nomenclature

The scientific and common names of plants herein specified or shown on the drawings conform with the approved names given in AJCHN-01, Standard Plant Names, except that where local usage does not follow this standard, the accepted local names are given in parentheses.

#### 2.2.2 Plant Material Labels

For the purpose of inspection and plant identification, durable, legible labels stating in weather-resistant ink the correct plant name and size, as specified in the list of required plants, shall be securely attached to all plants, bundles, and containers of plant material delivered at the planting site.

#### 2.2.3 Quality and Size

Quality and size of plants shall be in accordance with rules and grading adopted by the American Association of Nurserymen, Inc., and included in ANSI Z60.1. All plants shall be of excellent quality and have a normal habit of growth and shall be sound, healthy, vigorous, and free from disease and insect infestations, and damage. Trees shall have single straight trunks unless otherwise specified. Any tree with weak thin trunk

not capable of supporting itself when planted in the open will not be accepted. The minimum acceptable sizes of all plants, measured before pruning, with branches in normal position, shall conform to the measurements specified hereinafter in the list of required plants. Plants larger in size than specified may be used with the approval of the Contracting Officer, but the use of larger plants will make no change in contract price. If the use of larger plants is approved, the ball of earth or spread of roots shall be increased proportionately.

2.3 BURLAP

Burlap shall be made of jute and shall weigh not less than 255 ml per square meter. Substitute cloth shall possess an equal strength and resistance to tearing.

2.4 COMMERCIAL FERTILIZER

Fertilizer shall be commercial grade, free flowing, uniform in composition and conforming to CID A-A-1909.

2.4.1 Dry Fertilizer

a. Granular fertilizer

Consists of nitrogen-phosphorous-potassium ratio: 15 percent nitrogen, 5 percent phosphorous, and 10 percent potassium. The fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

b. Controlled-Release Fertilizer

Consists of nitrogen-phosphorous-potassium ratio: 15 percent nitrogen, 5 percent phosphorous, and 10 percent potassium. The fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.5 MATERIAL FOR STAKING

2.5.1 Stakes and Braces

Stakes for supporting trees shall be square, straight, sound, rough sawn, free from knots, and not less than nominal 50 mm by 50 mm square. Stakes and braces shall be painted green using approved wood stain.

2.5.2 Wire

Wires for tying trees to stakes shall be annealed galvanized steel or steel of gages hereinafter specified.

2.6 MULCH

Mulch shall consist of materials as specified below:

a. Recycled Compost

Compost shall be a well decomposed, stable, weed free organic matter source. It shall be derived from food, agricultural, or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 10 mm screen, possess a pH of 5.5 to 8.0, and have a moisture content between 35-55 percent by weight. The material shall not contain more than 1 percent or less by weight of man-made foreign matter. Compost shall be cleaned of plastic materials larger than 50 mm in length.

b. Woodbark

At the Contractor's option, woodbark may be used as mulch. Woodbark shall be a natural product of pine bark. The bark shall be manufactured for the use of plant mulch and shall be free from weed, seed, soil, plant diseases and insects.

## 2.7 TOPSOIL

Topsoil shall be obtained from stockpiled sources. The topsoil source shall be inspected by the Contracting Officer to determine if the selected soils meet the following requirements. The topsoil shall be stripped from the top 100 mm to 150 mm surface layer of soil. Topsoil shall be fertile, friable, natural surface soil, free of subsoil, clods, shale, trash, toxic substances, stones 25 mm in maximum dimension or larger, Bermudagrass, Johnsongrass, nutgrass (Cyperus rotundus), or other objectionable and hard to eradicate weeds or grasses.

## 2.8 WATER

Water shall be kept free from oil, acids, alkali, salt, and other substances harmful to the growth of plants. The source of water and service outlets used shall be subject to approval of the Contracting Officer.

## 2.9 GEOTEXTILE

Geotextile shall be woven or nonwoven; polypropylene, polyester, or fiberglass, mat in accordance with ASTM D 5034 or ASTM D 5035. It shall be made specifically for use as a fabric around plant material. Nominal weight shall be a minimum 120 grams per square meter. Permeability rate shall be a minimum 1 mm per second.

# PART 3 EXECUTION

## 3.1 PLANTING SEASON

The planting season for trees and shrubs shall be from 1 January to 15 March; planting shall be accomplished during the first planting season, or

portion thereof (but not less than 15 days), following substantial completion of building construction. Actual planting shall be performed during the specified periods only when weather and soil conditions are suitable and in accordance with locally accepted practice, as approved by the Contracting Officer. Deviation from the planting dates will be permitted only when approved in writing by the Contracting Officer.

## 3.2 OBSTRUCTIONS BELOW GROUND

Any rock or other underground obstruction shall be removed to the depth necessary to permit proper planting, according to plans and specifications. If underground construction, obstructions, or rock are encountered in excavation of planting areas, other locations for the planting may be selected by the Contracting Officer. Explosives may be used for removal of rock or oil foundation structures only where and as expressly approved by the Contracting Officer. The Contractor shall familiarize himself with all existing underground utility locations and shall avoid damaging them during planting operations. The Contractor shall repair at his own expense any damage to existing utilities and such repairs shall be in a manner directed by the Contracting Officer.

## 3.3 PLANTING OPERATIONS

### 3.3.1 Layout of Major Planting

Locations for plants and outlines of areas to be planted shall be marked on the ground by the Contractor and approved by the Contracting Officer before any excavation is made. No shrubs shall be planted less than 914 mm from a building unless specifically indicated on the drawings or designated by the Contracting Officer. In the event obstructions are encountered which prevent planting as indicated, the plant or plants will be planted in a new location, as directed by the Contracting Officer.

### 3.3.2 Protection of Planting Areas

Before excavations are made, precautionary measures shall be taken to protect all turfed areas that are to be trucked over and upon which soil is to be temporarily stacked pending removal or reuse of the soil for the filling of holes, pits, and beds. Existing trees, shrubbery, and beds that are to be preserved shall be barricaded in a manner to afford effective protection during planting operations.

### 3.3.3 Excavation for Planting

Excavation for planting shall include the stripping and stacking of all acceptable topsoil encountered within the areas to be excavated for trenches, plant pits, and planting beds. Excavations of trenches, tree holes and plant pits shall extend to the required subgrades as indicated on the drawings but in no case shall be less than as specified. Plant pits shall be circular in outline and shall have vertical sides and flat bottoms, or may be machine dug in a square shape with vertical sides and flat bottoms provided the minimum width of square pits is as great as the diameter for the circular pits. Planting beds in which ground cover or similar planting are indicated shall be excavated to the depth shown on the

drawings and as required to eliminate Bermudagrass, Johnsongrass, nutgrass (Cyperus rotundus) or similar objectionable vegetation which would seriously compete with the plantings. In the event such vegetation is present, the surface soil shall be stripped to a depth of 150 mm to 305 mm, as required to eliminate underground rootstalks or rhizomes.

3.3.4 Preparation of Planting Beds (PB)

3.3.4.1 Preparation

(AM#0002)The planting beds for trees, shrubs and ground cover, outlines of which are shown on the drawings, shall be dug to a depth equal to the height of the root ball as measured from the base of the ball to the base of the plant trunk.. The acceptable topsoil which is free of noxious plants shall be stockpiled and used as backfilled material. Unacceptable excavated soil shall be disposed of as directed by the Contracting Officer. During excavation operations all roots, stones, grade stakes or other objects 25 mm in maximum dimension or larger shall be removed from beds and disposed of as directed by the Contracting Officer.

3.3.4.2 Backfilling

Plant material shall be set plumb and held in position until sufficient soil has been firmly placed around root system or ball. In relation to the surrounding grade, the plant material shall be set even with the grade at which it was grown. The backfill soil mixture may be a mix of topsoil and soil amendments suitable for the plant material specified. When practical, the excavated soil from the plant pit that is not amended provides the best backfill and shall be used. Prior to backfilling, all metal, wood, synthetic products, or treated burlap devices shall be removed from the ball or root system avoiding damage to the root system. The backfill procedure shall remove air pockets from around the root system.

3.3.5 Disposal of Excess Soil

Acceptable excess excavated topsoil shall be wasted uniformly over nearby low or rough lawn areas, or otherwise disposed of as approved by the Contracting Officer. Excess soils not required or not suitable for above usage shall be disposed of on or off the reservation as directed by the Contracting Officer, within 24 hours following excavation.

3.3.6 Setting Plants

Plant material shall be set plumb and held in position until sufficient soil has been firmly placed around root system or ball. In relation to the surrounding grade, the plant material shall be set even with the grade at which it was grown. Trees shall be set plumb and rigidly braced in position until the soil has been tamped solidly around the ball or roots. Plants shall be planted in approved topsoil, as specified herein, which shall be thoroughly settled by watering and tamping.

3.3.6.1 Balled and Burlapped Plants

Biodegradable burlap and tying material shall be carefully opened and

folded back from the top a minimum 1/3 depth from the top of the root ball. Backfill mixture shall be added to the plant pit in 150 mm layers with each layer tamped.

3.3.6.2 Container-Grown Plants

The plant material shall be carefully removed from containers that are not biodegradeable. Prior to setting the plant in the pit, a maximum 1/4 depth of the root mass, measured from the bottom, shall be spread apart to promote new root growth. For plant material in biodegradable containers the container shall be split prior to setting the plant with container. Backfill mixture shall be added to the plant pit in 150 mm layers with each layer tamped.

3.3.7 Staking of Trees

3.3.7.1 Balled and Burlapped Trees

Trees 1.8 m to 2.4 m shall be firmly anchored in place with 2 bracing stakes placed on opposite sides. Bracing stakes shall be driven vertically into firm ground and shall not injure the ball or root system. The tree shall be held firmly between the stakes with a double strand of guying material. The guying material shall be firmly anchored at a minimum 1/2 tree height and shall prevent girdling. Chafing guards shall be used when metal is the guying material.

3.3.7.2 Flags

A flag shall be securely fastened to each guy line equidistant between the tree and the stake, deadmen, or earth anchor. The flag shall be visible to pedestrians.

3.3.8 Pruning

Pruning shall be accomplished by trained and experienced personnel. The pruning of trees shall be in accordance with ANSI A300. Only dead or broken material shall be pruned from installed plants. The typical growth habit of individual plant material shall be retained. Clean cuts shall be made flush with the parent trunk. Improper cuts, stubs, dead and broken branches shall be removed. "Headback" cuts at right angles to the line of growth will not be permitted. Trees shall not be poled or the leader removed, nor shall the leader be pruned or "topped off".

3.3.9 Placing Geotextile and Mulching

Prior to placing mulch, geotextile shall be placed as indicated in accordance with the manufacturer's recommendations. The placement of mulch shall occur a maximum 48 hours after planting. Mulch, used to reduce soil water loss, regulate soil temperature and prevent weed growth, shall be spread to cover the installed area with a minimum 100 mm uniform thickness. Mulch shall be kept out of the crowns of shrubs, ground cover, and vines and shall be kept off buildings, sidewalks and other facilities..

3.4 MAINTENANCE OPERATIONS

3.4.1 Maintenance During Planting Operation

Installed plant material shall be maintained in a healthy growing condition. Maintenance operations shall begin immediately after each plant is installed to prevent desiccation and shall continue until the plant establishment period commences. Installed areas shall be kept free of weeds, grass, and other undesired vegetation. The maintenance includes maintaining the mulch, watering, and adjusting settling.

3.4.2 Plant Establishment Period

3.4.2.1 Commencement

Upon completion of the last day of the planting operation, the plant establishment period for maintaining installed plant material in a healthy growing condition shall commence and shall be in effect for 12 months. Written calendar time period shall be furnished for the plant establishment period. When there is more than one plant establishment period, the boundaries of the planted area covered for each period shall be described. The plant establishment period shall be coordinated with Section 02933 ESTABLISHMENT OF TURF. The plant establishment period shall be modified for inclement weather shut down periods, or for separate completion dates for areas.

3.4.2.2 Maintenance During Establishment Period

Maintenance of plant material shall include straightening plant material, straightening stakes; tightening guying material; correcting girdling; supplementing mulch; pruning dead or broken branch tips; maintaining plant material labels; watering; eradicating weeds, insects and disease; post-fertilization; and removing and replacing unhealthy plants.

3.4.2.3 Watering Plant Material

The plant material shall be watered as necessary to prevent desiccation and to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is estimated to be the equivalent of 25 mm absorbed water per week, delivered in the form of rain or augmented by watering. Run-off, puddling and wilting shall be prevented. Unless otherwise directed, watering trucks shall not be driven over turf areas. Watering of other adjacent areas or existing plant material shall be prevented.

3.4.2.4 Weeding

Grass and weeds in the installed areas shall not be allowed to reach a maximum 75 mm height before being completely removed, including the root system.

3.4.2.5 Post- Fertilization

The plant material shall be topdressed at least once during the period of establishment with controlled release fertilizer, reference paragraph SOIL

AMENDMENTS. Apply at the rate of 1 kilogram per 10 square meters of plant pit or bed area. Dry fertilizer adhering to plants shall be flushed off. The application shall be timed prior to the advent of winter dormancy.

3.4.2.6 Plant Pit Settling

When settling occurs to the backfill soil mixture, additional backfill soil shall be added to the plant pit or plant bed until the backfill level is equal to the surrounding grade. Serious settling that affects the setting of the plant in relation to the maximum depth at which it was grown requires replanting in accordance with paragraph INSTALLATION. The earth berm shall be maintained.

3.4.2.7 Maintenance Record

A record shall be furnished describing the maintenance work performed, the quantity of plant losses, diagnosis of the plant loss, and the quantity of replacements made on each site visit.

3.5 Unhealthy Plant Material

A tree shall be considered unhealthy or dead when the main leader has died back, or up to a maximum 25 percent of the crown has died. A shrub shall be considered unhealthy or dead when up to a maximum 25 percent of the plant has died. This condition shall be determined by scraping on a branch an area 2 mm square, maximum, to determine if there is a green cambium layer below the bark. The Contractor shall determine the cause for unhealthy plant material and shall provide recommendations for replacement. Unhealthy or dead plant material shall be removed immediately and shall be replaced as soon as seasonal conditions permit.

3.6 REPLACEMENT

Unless otherwise directed, plant material shall be provided for replacement in accordance with paragraph PLANT MATERIAL. Replacement plant material shall be installed in accordance with paragraph INSTALLATION, and recommendations in paragraph PLANT ESTABLISHMENT PERIOD. Plant material shall be replaced in accordance with paragraph WARRANTY. An extended plant establishment period shall not be required for replacement plant material.

3.7 Maintenance Instructions

Written instructions shall be furnished containing drawings and other necessary information for year-round care of the installed plant material; including, when and where maintenance should occur, and the procedures for plant material replacement.

3.8 RESTORATION AND CLEAN UP

3.8.1 Restoration

Turf areas, pavements and facilities that have been damaged from the planting operation shall be restored to original condition at the

Contractor's expense.

3.8.2 Clean Up

Excess and waste material shall be removed from the installed area and shall be disposed offsite. Adjacent paved areas shall be cleared.

-- End of Section --

SECTION 15895

AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM
**02/94**
**AMENDMENT NO. 0002**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

| | |
|---|---|
| ARI 350 | (1986) Sound Rating of Non-Ducted Indoor Air-Conditioning Equipment |
| ARI 410 | (1991) Forced-Circulation Air-Cooling and Air-Heating Coils |
| ARI 430 | (1989) Central-Station Air-Handling Units |
| ARI 440 | (1997) Room Fan-Coil and Unit Ventilator |
| ARI 445 | (1987; R 1993) Room Air-Induction Units |
| ARI 880 | (1994) Air Terminals |
| ARI Guideline D | (1996) Application and Installation of Central Station Air-Handling Units |

AIR CONDITIONING CONTRACTORS OF AMERICA (ACCA)

| | |
|---|---|
| ACCA Manual 4 | (1990) Installation Techniques for Perimeter Heating & Cooling; 11th Edition |

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

| | |
|---|---|
| AMCA 210 | (1985) Laboratory Methods of Testing Fans for Rating |
| AMCA Std 300 | (1996) Reverberant Room Method for Sound Testing of Fans |

AMERICAN BEARING MANUFACTURERS ASSOCIATION (AFBMA)

| | |
|---|---|
| AFBMA Std 9 | (1990) Load Ratings and Fatigue Life for Ball Bearings |

| | |
|---|---|
| AFBMA Std 11 | (1990) Load Ratings and Fatigue Life for Roller Bearings |

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

| | |
|---|---|
| ANSI S12.32 | (1990; R 1996) Precision Methods for the Determination of Sound Power Levels of Discrete-Frequency and Narrow-Band Noise Sources in Reverberation Rooms |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|---|---|
| ASTM A 47 | (1990; R 1995) Ferritic Malleable Iron Castings |
| ASTM A 47M | (1990; R 1996) Ferritic Malleable Iron Castings (Metric) |
| ASTM A 53 | (1997) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless |
| ASTM A 106 | (1997a) Seamless Carbon Steel Pipe for High-Temperature Service |
| ASTM A 123/A 123M | (1997a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products |
| ASTM A 167 | (1996) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip |
| ASTM A 181/A 181M | (1995b) Carbon Steel, Forgings for General-Purpose Piping |
| ASTM A 183 | (1983; R 1998) Carbon Steel Track Bolts and Nuts |
| ASTM A 193/A 193M | (1998)( Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service |
| ASTM A 234/A 234M | (1997) Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service |
| ASTM A 536 | (1984; R 1993) Ductile Iron Castings |
| ASTM A 733 | (1993) Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples |
| ASTM A 924/A 924M | (1997a) General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip |

| | |
|---|---|
| | Process |
| ASTM B 62 | (1993) Composition Bronze or Ounce Metal Castings |
| ASTM B 75 | (1997) Seamless Copper Tube |
| ASTM B 75M | (1997) Seamless Copper Tube (Metric) |
| ASTM B 88 | (1996) Seamless Copper Water Tube |
| ASTM B 88M | (1996) Seamless Copper Water Tube (Metric) |
| ASTM B 117 | (1997) Operating Salt Spray (FOG) Apparatus |
| ASTM B 650 | (1995) Electrodeposited Engineering Chromium Coatings on Ferrous Substrates |
| ASTM B 813 | (1993) Liquid and Paste Fluxes for Soldering Applications for Copper and Copper Alloy Tube |
| ASTM C 916 | (1985; R 1996) Adhesives for Duct Thermal Insulation |
| ASTM C 1071 | (1998) Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material) |
| ASTM D 520 | (1984; R 1995) Zinc Dust Pigment |
| ASTM D 1384 | (1997a) Corrosion Test for Engine Coolants in Glassware |
| ASTM D 1654 | (1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments |
| ASTM D 1785 | (1996b) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 |
| ASTM D 2000 | (1998) Rubber Products in Automotive Applications |
| ASTM D 2466 | (1997) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40 |
| ASTM D 2564 | (1996a) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems |
| ASTM D 2855 | (1996) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings |
| ASTM D 3359 | (1997) Measuring Adhesion by Tape Test |

| | |
|---|---|
| ASTM E 84 | (1998el) Surface Burning Characteristics of Building Materials |
| ASTM E 437 | (1992) Industrial Wire Cloth and Screens (Square Opening Series) |
| ASTM F 872 | (1984; R 1990) Filter Units, Air-Conditioning: Viscous-Impingement Type, Cleanable |
| ASTM F 1199 | (1988; R 1993) Cast (All Temperature and Pressures) and Welded Pipe Line Strainers (150 psig and 150 degrees F Maximum) |
| ASTM F 1200 | (1988; R 1998) Fabricated (Welded) Pipe Line Strainers (Above 150 psig and 150 degrees F) |

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

| | |
|---|---|
| ASHRAE 15 | (1994) Safety Code for Mechanical Refrigeration |
| ASHRAE 52.1 | (1992) Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter |
| ASHRAE ANSI/ASHRAE 68 | (1986) Laboratory Method of Testing In-Duct Sound Power Measurement Procedures for Fans |
| ASHRAE 70 | (1991) Method of Testing for Rating the Performance of Air Outlets and Inlets |
| ASHRAE 84 | (1991) Method of Testing Air-to-Air Heat Exchangers |

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

| | |
|---|---|
| ASME B1.20.1 | (1983; R 1992) Pipe Threads, General Purpose (Inch) |
| ASME B16.3 | (1992) Malleable Iron Threaded Fittings |
| ASME B16.5 | (1996; B16.5a) Pipe Flanges and Flanged Fittings NPS 1/2 thru NPS 24 |
| ASME B16.9 | (1993) Factory-Made Wrought Steel Buttwelding Fittings |
| ASME B16.11 | (1996) Forged Fittings, Socket-Welding and |

Threaded

ASME B16.18 (1984; R 1994) Cast Copper Alloy Solder Joint Pressure Fittings

ASME B16.21 (1992) Nonmetallic Flat Gaskets for Pipe Flanges

ASME B16.22 (1995; B16.22a) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

ASME B16.26 (1988) Cast Copper Alloy Fittings for Flared Copper Tubes

ASME B16.39 (1986; R 1998) Malleable Iron Threaded Pipe Unions Classes 150, 250, and 300

ASME B31.1 (1998) Power Piping

ASME B40.1 (1991) Gauges - Pressure Indicating Dial Type - Elastic Element

ASME BPV IX (1998) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C606 (1997) Grooved and Shouldered Joints

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (1998) Structural Welding Code - Steel

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-1419 (Rev D) Filter Element, Air Conditioning (Viscous-Impingement and Dry Types, Replaceable)

EXPANSION JOINT MANUFACTURERS ASSOCIATION (EJMA)

EJMA Stds (1993; Addenda 1995; Errata 1996; 7th Ed. 1998) EJMA Standards

HYDRAULIC INSTITUTE (HI)

HI 1.1-1.5 (1994) Centrifugal Pumps

INSTITUTE OF ENVIRONMENTAL SCIENCES (IES)

IES RP-CC-001.3 (1993) HEPA and ULPA Filters

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS

INDUSTRY (MSS)

| | |
|---|---|
| MSS SP-25 | (1998) Standard Marking System for Valves, Fittings, Flanges and Unions |
| MSS SP-58 | (1993) Pipe Hangers and Supports - Materials, Design and Manufacture |
| MSS SP-69 | (1996) Pipe Hangers and Supports - Selection and Application |
| MSS SP-70 | (1998) Cast Iron Gate Valves, Flanged and Threaded Ends |
| MSS SP-71 | (1997) Cast Iron Swing Check Valves, Flanges and Threaded Ends |
| MSS SP-72 | (1992) Ball Valves with Flanged or Butt-Welding Ends for General Service |
| MSS SP-80 | (1997) Bronze Gate, Globe, Angle and Check Valves |
| MSS SP-85 | (1994) Cast Iron Globe & Angle Valves, Flanged and Threaded Ends |
| MSS SP-110 | (1996) Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends |

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

| | |
|---|---|
| NEMA 250 | (1997) Enclosures for Electrical Equipment (1000 Volts Maximum) |
| NEMA MG 1 | (1993; Rev 1; Rev 2; Rev 3; Rev 4) Motors and Generators |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 70 | (1999) National Electrical Code |
| NFPA 90A | (1996) Installation of Air Conditioning and Ventilating Systems |
| NFPA 96 | (1998) Ventilation Control and Fire Protection of Commercial Cooking Equipment |

NORTH AMERICAN INSULATION MANUFACTURERS ASSOCIATION (NAIMA)

| | |
|---|---|
| NAIMA AH115 | (1993) Fibrous Glass Duct Construction Standards |

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION

(SMACNA)

| | |
|---|---|
| SMACNA Industry Practice | (1975) Accepted Industry Practice for Industrial Duct Construction |
| SMACNA Install Fire Damp HVAC | (1992) Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems |
| SMACNA HVAC Duct Const Stds | (1995; Addenda Nov 1997) HVAC Duct Construction Standards - Metal and Flexible |
| SMACNA Leakage Test Mnl | (1985) HVAC Air Duct Leakage Test Manual |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 94 | (1996; Rev thru Jul 1998) Tests for Flammability of Plastic Materials for Parts in Devices and Appliances |
| UL 181 | (1996; Rev Dec 1998) Factory-Made Air Ducts and Air Connectors |
| UL 214 | (1997) Tests for Flame-Propagation of Fabrics and Films |
| UL 555 | (1995) Fire Dampers |
| UL 586 | (1996) High-Efficiency, Particulate, Air Filter Units |
| UL 705 | (1994; Rev thru Mar 1996) Power Ventilators |
| UL 723 | (1996) Test for Surface Burning Characteristics of Building Materials |
| UL 900 | (1994; Rev thru Apr 1997) Test Performance of Air Filter Units |
| UL 1995 | (1995; Rev thru Jul 1998) Heating and Cooling Equipment |
| UL Bld Mat Dir | (1998) Building Materials Directory |
| UL Elec Const Dir | (1998; Supple) Electrical Construction Equipment Directory |
| UL Fire Resist Dir | (1998) Fire Resistance Directory (2 Vol.) |

## 1.2 COORDINATION OF TRADES

Ductwork, piping offsets, fittings, and accessories shall be furnished as required to provide a complete installation and to eliminate interference with other construction.

1.3 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Components and Equipment Data; GA.

Manufacturer's catalog data shall be included with the detail drawings for the following items. The data shall be highlighted to show model, size, options, etc., that are intended for consideration. Data shall be adequate to demonstrate compliance with contract requirements for the following:

a. Piping Components

b. Ductwork Components

c. Air Systems Equipment

d. Air Handling Units

SD-04 Drawings

Air Supply, Distribution, Ventilation, and Exhaust Equipment; FIO.

Drawings shall consist of equipment layout including assembly and installation details and electrical connection diagrams; ductwork layout showing the location of all supports and hangers, typical hanger details, gauge reinforcement, reinforcement spacing rigidity classification, and static pressure and seal classifications; and piping layout showing the location of all guides and anchors, the load imposed on each support or anchor, and typical support details. Drawings shall include any information required to demonstrate that the system has been coordinated and will properly function as a unit and shall show equipment relationship to other parts of the work, including clearances required for operation and maintenance.

SD-06 Instructions

Test Procedures; FIO.

Proposed test procedures for piping hydrostatic test and performance tests of systems, at least 2 weeks prior to the start of related testing.

Welding Procedures; FIO.

A copy of qualified welding procedures, at least 2 weeks prior to the start of welding operations.

System Diagrams; GA.

Proposed diagrams, at least 2 weeks prior to start of related testing. System diagrams that show the layout of equipment, piping, and ductwork, and typed condensed operation manuals explaining preventative maintenance procedures, methods of checking the system for normal, safe operation, and procedures for safely starting and stopping the system shall be framed under glass or laminated plastic. After approval, these items shall be posted where directed.

SD-07 Schedules

Test Schedules; FIO.

Proposed test schedules for hydrostatic test of piping, ductwork leak test, and performance tests, at least 2 weeks prior to the start of related testing.

Field Training Schedule; FIO.

Proposed schedule for field training, at least 2 weeks prior to the start of related training.

SD-08 Statements

Similar Services; FIO.

Statement demonstrating successful completion of similar services on at least 5 projects of similar size and scope, at least 2 weeks prior to submittal of other items required by this section.

Welding Qualification; FIO.

A list of names and identification symbols of qualified welders and welding operators, at least 2 weeks prior to the start of welding operations.

SD-09 Reports

Test Reports; FIO.

Test reports for performance tests in booklet form, upon completion of testing. Reports shall document phases of tests performed including initial test summary, repairs/adjustments made, and final test results.

SD-13 Certificates

Bolts; FIO.

Written certification from the bolt manufacturer that the bolts furnished comply with the requirements of this specification. The certification

shall include illustrations of product markings, and the number of each type of bolt to be furnished.

SD-19 Operation and Maintenance Manuals

Air Supply, Distribution, Ventilation, and Exhaust Manuals; GA.

Six manuals listing step-by-step procedures required for system startup, operation, shutdown, and routine maintenance, at least 2 weeks prior to field training. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. Each service organization submitted shall be capable of providing 4 hour onsite response to a service call on an emergency basis.

## PART 2 PRODUCTS

### 2.1 STANDARD PRODUCTS

Components and equipment shall be standard products of a manufacturer regularly engaged in the manufacturing of products that are of a similar material, design and workmanship. The standard products shall have been in satisfactory commercial or industrial use for 2 years before bid opening. The 2-year experience shall include applications of components and equipment under similar circumstances and of similar size. The 2 years must be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. The equipment items shall be supported by a service organization.

### 2.2 ASBESTOS PROHIBITION

Asbestos and asbestos-containing products shall not be used.

### 2.3 NAMEPLATES

Equipment shall have a nameplate that identifies the manufacturer's name, address, type or style, model or serial number, and catalog number.

### 2.4 EQUIPMENT GUARDS AND ACCESS

Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts exposed to personnel contact shall be fully enclosed or guarded according to OSHA requirements. High temperature equipment and piping exposed to contact by personnel or where it creates a potential fire hazard shall be properly guarded or covered with insulation of a type specified.

## 2.5 PIPING COMPONENTS

### 2.5.1 Steel Pipe

Steel pipe shall conform to ASTM A 53, Schedule 40, Grade A or B, Type E or S.

### 2.5.2 Joints and Fittings For Steel Pipe

Joints shall be welded, flanged, threaded, or grooved as indicated. If not otherwise indicated, piping 25 mm (1 inch) and smaller shall be threaded; piping larger than 25 mm (1 inch) and smaller than 80 mm (3 inches) shall be either threaded, grooved, or welded; and piping 80 mm (3 inches) and larger shall be grooved, welded, or flanged. Rigid grooved mechanical joints and fittings may only be used in serviceable aboveground locations where the temperature of the circulating medium does not exceed 110 degrees C. Flexible grooved joints shall be used only as a flexible connector with grooved pipe system. Unless otherwise specified, grooved piping components shall meet the corresponding criteria specified for the similar welded, flanged, or threaded component specified herein. The manufacturer of each fitting shall be permanently identified on the body of the fitting according to MSS SP-25.

#### 2.5.2.1 Welded Joints and Fittings

Welded fittings shall conform to ASTM A 234/A 234M, and shall be identified with the appropriate grade and marking symbol. Butt-welded fittings shall conform to ASME B16.9. Socket-welded fittings shall conform to ASME B16.11.

#### 2.5.2.2 Flanged Joints and Fittings

Flanges shall conform to ASTM A 181/A 181M and ASME B16.5, Class 150. Gaskets shall be nonasbestos compressed material according to ASME B16.21, 2.0 mm thickness, full face or self-centering flat ring type. The gaskets shall contain aramid fibers bonded with styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR). Bolts, nuts, and bolt patterns shall conform to ASME B16.5. Bolts shall be high or intermediate strength material conforming to ASTM A 193/A 193M.

#### 2.5.2.3 Threaded Joints and Fittings

Threads shall conform to ASME B1.20.1. Unions shall conform to ASME B16.39, Class 150. Nipples shall conform to ASTM A 733. Malleable iron fittings shall conform to ASME B16.3, type as required to match piping.

#### 2.5.2.4 Dielectric Unions and Flanges

Dielectric unions shall have the tensile strength and dimensional requirements specified. Unions shall have metal connections on both ends threaded to match adjacent piping. Metal parts of dielectric unions shall be separated with a nylon insulator to prevent current flow between dissimilar metals. Unions shall be suitable for the required operating pressures and temperatures. Dielectric flanges shall provide the same

pressure ratings as standard flanges and provide complete electrical isolation.

2.5.2.5 Grooved Mechanical Joints and Fittings

Joints and fittings shall be designed for not less than 862 kPa (125 psig) service and shall be the product of the same manufacturer. Fitting and coupling houses shall be malleable iron conforming to ASTM A 47,and ASTM A 47M, Grade 32510; ductile iron conforming to ASTM A 536, Grade 65-45-12; or steel conforming to ASTM A 106, Grade B or ASTM A 53. Gaskets shall be molded synthetic rubber with central cavity, pressure responsive configuration and shall conform to ASTM D 2000 Grade No. 2CA615A15B44F17Z for circulating medium up to 110 degrees C or Grade No. M3BA610A15B44Z for circulating medium up to 93 degrees C. Grooved joints shall conform to AWWA C606. Coupling nuts and bolts shall be steel and shall conform to ASTM A 183.

2.5.3 Copper Tube

Copper tube shall conform to ASTM B 88, and ASTM B 88M, Type K or L.

2.5.4 Joints and Fittings For Copper Tube

Wrought copper and bronze solder-joint pressure fittings shall conform to ASME B16.22 and ASTM B 75M. . Cast copper alloy solder-joint pressure fittings shall conform to ASME B16.18. Cast copper alloy fittings for flared copper tube shall conform to ASME B16.26 and ASTM B 62. Brass or bronze adapters for brazed tubing may be used for connecting tubing to flanges and to threaded ends of valves and equipment. Extracted brazed tee joints produced with an acceptable tool and installed as recommended by the manufacturer may be used.

2.5.5 Valves

Valves shall be Class 125 and shall be suitable for the intended application. Valves shall meet the material, fabrication and operating requirements of ASME B31.1. Chain operators shall be provided for valves located 3 meters or higher above the floor. Valves in sizes larger than 25 mm (1 inch) and used on steel pipe systems, may be provided with rigid grooved mechanical joint ends. Such grooved end valves shall be subject to the same requirements as rigid grooved mechanical joints and fittings and, shall be provided by the same manufacturer as the grooved pipe joint and fitting system.

2.5.5.1 Gate Valves

Gate valves 65 mm (2-1/2 inches) and smaller shall conform to MSS SP-80 and shall be bronze with rising stem and threaded, solder, or flanged ends. Gate valves 80 mm (3 inches) and larger shall conform to MSS SP-70 and shall be cast iron with bronze trim, outside screw and yoke, and flanged or threaded ends.

2.5.5.2 Globe Valves

Globe valves 65 mm (2-1/2 inches) and smaller shall conform to MSS SP-80, bronze, threaded, soldered, or flanged ends. Globe valves 80 mm (3 inches) and larger shall conform to MSS SP-85 and shall be cast iron with bronze trim and flanged, or threaded ends.

2.5.5.3 Check Valves

Check valves 65 mm (2-1/2 inches) and smaller shall conform to MSS SP-80 and shall be bronze with threaded, soldered, or flanged ends. Check valves 80 mm (3 inches) and larger shall conform to MSS SP-71 and shall be cast iron with bronze trim and flanged or threaded ends.

2.5.5.4 Angle Valves

Angle valves 65 mm (2-1/2 inches) and smaller shall conform to MSS SP-80 and shall be bronze with threaded, soldered, or flanged ends. Angle valves 80 mm (3 inches) and larger shall conform to MSS SP-85and shall be cast iron with bronze trim and flanged, or threaded ends.

2.5.5.5 Ball Valves

Ball valves 15 mm (1/2 inch) and larger shall conform to MSS SP-72 or MSS SP-110, and shall be ductile iron or bronze with threaded, soldered, or flanged ends.

2.5.5.6 Butterfly Valves

Butterfly valves shall be 2 flange or lug wafer type, and shall be bubble-tight at 1.03 MPa. Valve bodies shall be cast iron, malleable iron, or steel. ASTM A 167, Type 404 or Type 316, corrosion resisting steel stems, bronze or corrosion resisting steel discs, and synthetic rubber seats shall be provided. Valves smaller than 200 mm (8 inches) shall have throttling handles with a minimum of seven locking positions. Valves 200 mm (8 inches) and larger shall have totally enclosed manual gear operators with adjustable balance return stops and position indicators. Valves in insulated lines shall have extended neck to accommodate insulation thickness.

2.5.5.7 Balancing Valves

Manual Balancing Valves. Balancing valves 50 mm (2 inches) or smaller shall be bronze with NPT connections for black steel pipe and brazed connections for copper tubing. Valves 25 mm (1 inch) or larger may be all iron with threaded or flanged ends. The valves shall have a square head or similar device and an indicator arc and shall be designed for 120 degrees C. Iron valves shall be lubricated, nonlubricated, or tetrafluoroethylene resin-coated plug valves. In lieu of plug valves, ball valves may be used. Plug valves and ball valves 200 mm (8 inches) larger shall be provided with manual gear operators with position indicators.

Calibrated Balancing Valves. Calibrated balancing valves shall have meter connections with positive shutoff valves. An integral pointer shall register the degree of valve opening. Valves shall be calibrated so that flow rate can be determined when valve opening in degrees and pressure

differential across valve is known. Each balancing valve shall be constructed with internal seals to prevent leakage and shall be supplied with preformed insulation. Valves shall be suitable for 120 degrees C temperature and working pressure of the pipe in which installed. Valve bodies shall be provided with tapped openings and pipe extensions with shutoff valves outside of pipe insulation. The pipe extensions shall be provided with quick connecting hose fittings for a portable meter to measure the pressure differential. In lieu of the balancing valve with integral metering connections, a ball valve or plug valve with a separately installed orifice plate or venturi tube may be used for balancing.

Automatic Flow Control Valves. In lieu of balancing valves specified, automatic flow control valves may be provided to maintain constant flow, and shall be designed to be sensitive to pressure differential across the valve to provide the required opening. Valves shall be selected for the flow required and provided with a permanent nameplate or tag carrying a permanent record of the factory-determined flow rate and flow control pressure levels. Valves shall control the flow within 5 percent of the tag rating. Valves shall be suitable for the maximum operating pressure of 862 kPa (125 psig) or 150 percent of the system operating pressure, whichever is the greater. Where the available system pressure is not adequate to provide the minimum pressure differential that still allows flow control, the system pump head capability shall be appropriately increased. Where flow readings are provided by remote or portable meters, valve bodies shall be provided with tapped openings and pipe extensions with shutoff valves outside of pipe insulation. The pipe extensions shall be provided with quick connecting hose fittings for a portable meter to measure the pressure differential across the automatic flow control valve. Automatic flow control valve specified may be substituted for orifice plate or venturi tube flow measuring devices.

Portable Differential Meters. One portable differential meter shall be furnished if calibrated balancing valve or automatic flow control valve is required. The meter suitable for the operating pressure specified shall be complete with hoses, vent, shutoff valves, and carrying case as recommended by the valves manufacturer.

2.5.5.8 Air Vents

Manual air vents shall be brass or bronze valves or cocks suitable for pressure rating of piping system and furnished with threaded plugs or caps. Automatic air vents shall be float type, cast iron, stainless steel, or forged steel construction, suitable for pressure rating of piping system.

2.5.6 Strainers

Strainer shall be in accordance with ASTM F 1199, except as modified herein. Strainer shall be the cleanable, basket or "Y" type, the same size as the pipeline. The strainer bodies shall be fabricated of cast iron with bottoms drilled, and tapped. The bodies shall have arrows clearly cast on the sides indicating the direction of flow. Each strainer shall be equipped with removable cover and sediment screen. The screen shall be made of minimum 0.8 mm (22 gauge) brass sheet, monel, or corrosion-resistant steel, with small perforations numbering not less than

60 per square centimeter (400 per square inch) to provide a net free area through the basket of at least 3,300 times that of the entering pipe. The flow shall be into the screen and out through the perforations.

2.5.7 Combination Strainer and Suction Diffuser

A combination strainer and suction diffuser, consisting of an angle type body with removable strainer basket and straightening vanes, a suction pipe support, and a blowdown outlet, shall be provided on pump suction. The combination strainer and suction diffuser shall be in accordance with ASTM F 1199, except as modified herein.

2.5.8 Pump Discharge Valves

Pump discharge valves shall be installed where indicated and shall perform the functions of a nonslam check valve, a manual balancing valve, and a shutoff. Valves shall be of cast iron or ductile iron construction with bronze and/or stainless steel accessories. Valves shall have an integral pointer which registers the degree of valve opening. Flow through the valve shall be manually adjustable from bubble tight shutoff to full flow. Valves smaller than 50 mm (2 inches) shall have NPT connections. Valves 50 mm (2 inches) and larger shall have flanged or grooved end connections. The valve design shall allow the back seat for the stem to be replaced in the field under full line pressure.

2.5.9 Backflow Preventers

Backflow preventers shall be according to Section 15400 PLUMBING, GENERAL PURPOSE.

2.5.10 Flexible Pipe Connectors

Flexible pipe connectors shall be designed for 862 kPa (125 psi) or 1034 kPa (150 psi) service as appropriate for the static head plus the system head, and 120 degrees C, 110 degrees C for grooved end flexible connectors. The flexible section shall be constructed of rubber, tetrafluoroethylene resin, or corrosion-resisting steel, bronze, monel, or galvanized steel. The flexible section shall be suitable for intended service with end connections to match adjacent piping. Flanged assemblies shall be equipped with limit bolts to restrict maximum travel to the manufacturer's standard limits. Unless otherwise indicated, the length of the flexible connectors shall be as recommended by the manufacturer for the service intended. Internal sleeves or liners, compatible with circulating medium, shall be provided when recommended by the manufacturer. Covers to protect the bellows shall be provided where indicated.

2.5.11 Pressure Gauges

Gauges shall conform to ASME B40.1 and shall be provided with throttling type needle valve or a pulsation dampener and shut-off valve. Gauge shall be a minimum of 85 mm in diameter and shall have a range from 0 kPa to approximately 1.5 times the maximum system working pressure.

2.5.12 Thermometers

Thermometers shall have brass, malleable iron, or aluminum alloy case and frame, clear protective face, permanently stabilized glass tube with indicating-fluid column, white face, black numbers, and a 225 mm (9 inch) scale, and shall have rigid stems with straight, angular, or inclined pattern.

2.5.13 Escutcheons

Escutcheons shall be chromium-plated iron or chromium-plated brass, either one piece or split pattern, held in place by internal spring tension or setscrews.

2.5.14 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69.

2.5.15 Insulation

Shop and field applied insulation shall be as specified in Section 15080 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.5.16 Condensate Drain Lines

Condensate drainage shall be provided for each item of equipment that generates condensate as specified for drain, waste, and vent piping systems in Section 15400 PLUMBING, GENERAL PURPOSE.

2.5.17 Chilled Water Pumps

Chilled water pumps shall be the electrically driven, non-overloading, centrifugal type which conform to HI 1.1-1.5. Pump capacity, efficiency, and motor size shall be as indicated on the drawings. Pumps shall be selected at or near peak efficiency. Pump curve shall rise continuously from maximum capacity to shutoff. Shutoff head shall be approximately 20 percent greater than design head. Pump motor shall be totally enclosed and have sufficient wattage (horsepower) for the service required. Each pump motor shall be equipped with an across-the-line magnetic controller in a NEMA 250, Type 1 enclosure with "START-STOP" switch in the cover.

2.5.17.1 Construction

Shaft seal shall be mechanical-seal. Impeller shall be statically and dynamically balanced. Each pump casing shall be designed to withstand the discharge head specified plus the static head on system plus 50 percent of the total, but not less than 862 kPa (125 psig). Pump casing and bearing housing shall be close grained cast iron. High points in the casing shall be provided with manual air vents; low points shall be provided with drain plugs. Impeller, impeller wearing rings, glands, casing wear rings, and shaft sleeve shall be bronze. Shaft shall be carbon or alloy steel, turned and ground. Bearings shall be ball-bearings, roller-bearings, or oil-lubricated bronze-sleeve type bearings, and be efficiently sealed or isolated to prevent loss of oil or entrance of dirt or water. Pump and motor shall be mounted on a common cast iron base having lipped edges and

tapped drainage openings or structural steel base with lipped edges or drain pan and tapped drainage openings. Pump shall be provided with shaft coupling guard. Close coupled pumps shall be provided with drip pockets and tapped openings. Pump motor shall have the required capacity to prevent overloading with pump operating at any point on its characteristic curve. Pump speed shall not exceed 3,600 rpm, except where the pump head is less than 180 kPa, the pump speed shall not exceed 1,750 rpm. Pump shall be accessible for servicing without disturbing piping connections.

2.5.17.2 Mechanical Shaft Seals

Seals shall be single, inside mounted, end-face-elastomer bellows type with stainless steel spring, brass or stainless steel seal head, carbon rotating face, and tungsten carbide sealing face. Glands shall be bronze and of the water-flush design to provide lubrication flush across the face of the seal. Bypass line from pump discharge to flush connection in gland shall be provided, with filter or cyclone separator in line.

2.5.18 Hot Water Piping

Heating system hot water piping shall be as specified in Section 15569 WATER AND STEAM HEATING; OIL, GAS OR BOTH; UP TO 20 MBTUH.

2.6 ELECTRICAL WORK

Electrical motor-driven equipment specified shall be provided complete with motor, motor starter, and controls. Unless otherwise specified, electric equipment, including wiring and motor efficiencies, shall be according to Section 16415 ELECTRICAL WORK, INTERIOR. Electrical characteristics and enclosure type shall be as shown. Unless otherwise indicated, motors of 745 W and above shall be high efficiency type. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary. Each motor shall be according to NEMA MG 1 and shall be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices, but not shown, shall be provided. Where two-speed or variable-speed motors are indicated, solid-state variable-speed controller may be provided to accomplish the same function. Solid-state variable-speed controllers shall be utilized for motors rated 7.45 kW (10 hp) or less. Adjustable frequency drives shall be used for larger motors.

2.7 CONTROLS

Controls shall be provided as specified in Section 15950 HEATING, VENTILATING AND AIR CONDITIONING (HVAC) CONTROL SYSTEMS.

2.8 DUCTWORK COMPONENTS

2.8.1 Metal Ductwork

All aspects of metal ductwork construction, including all fittings and components, shall comply with SMACNA HVAC Duct Const Stds unless otherwise

specified. Elbows shall be radius type with a centerline radius of 1-1/2 times the width or diameter of the duct where space permits. Otherwise, elbows having a minimum radius equal to the width or diameter of the duct or square elbows with factory fabricated turning vanes may be used. Static pressure Class 125, 250, and 500 Pa (1/2, 1, and 2 inch w.g.) ductwork shall meet the requirements of Seal Class C. Sealants shall conform to fire hazard classification specified in Section 15080 THERMAL INSULATION FOR MECHANICAL SYSTEMS. Pressure sensitive tape shall not be used as a sealant. The sealant shall be applied to the exposed male part of the fitting collar so that the sealer will be on the inside of the joint and fully protected by the metal of the duct fitting. One brush coat of the sealant shall be applied over the outside of the joint to at least 50 mm band width covering all screw heads and joint gap. Dents in the male portion of the slip fitting collar will not be acceptable. Outdoor air intake ducts and plenums shall be fabricated with watertight soldered or brazed joints and seams.

2.8.1.1 Transitions

Diverging air flow transitions shall be made with each side pitched out a maximum of 15 degrees, for an included angle of 30 degrees. Transitions for converging air flow shall be made with each side pitched in a maximum of 30 degrees, for an included angle of 60 degrees, or shall be as indicated. Factory-fabricated reducing fittings for systems using round duct sections when formed to the shape of the ASME short flow nozzle, need not comply with the maximum angles specified.

2.8.1.2 Metallic Flexible Duct

Metallic type duct shall be single-ply galvanized steel. Duct shall be of corrugated/interlocked, folded and knurled type seam construction, bendable without damage through 180 degrees with a throat radius equal to 1/2 duct diameter. Duct shall conform to UL 181 and shall be rated for positive or negative working pressure of 3.75 kPa (15 inches water gauge) at 177 degrees C (350 degrees F) when duct is aluminum, and 343 degrees C (650 degrees F) when duct is galvanized steel or stainless steel.

2.8.1.3 Insulated Nonmetallic Flexible Duct Runouts

Flexible duct runouts shall be used only where indicated. Runout length shall be as shown on the drawings, but shall in no case exceed 3 m. Runouts shall be preinsulated, factory fabricated, and shall comply with NFPA 90A and UL 181. Either field or factory applied vapor barrier shall be provided. Insulated flexible connectors may be used as runouts. The insulated material and vapor barrier shall conform to the requirements of Section 15080 THERMAL INSULATION FOR MECHANICAL SYSTEMS. The insulation material surface shall not be exposed to the air stream.

2.8.1.4 General Service Duct Connectors

A flexible duct connector approximately 150 mm in width shall be provided where sheet metal connections are made to fans or where ducts of dissimilar metals are connected. For rectangular ducts, the flexible material locked to metal collars shall be installed using normal duct construction methods.

The composite connector system shall comply with UL 214 and be classified as "flame-retarded fabrics" in UL Bld Mat Dir.

2.8.2 Ductwork Accessories

2.8.2.1 Duct Access Doors

Access doors shall be provided in ductwork and plenums where indicated and at all air flow measuring primaries, automatic dampers, coils, thermostats, and other apparatus requiring service and inspection in the duct system, and unless otherwise shown, shall conform to SMACNA HVAC Duct Const Stds. Access doors shall be provided upstream and downstream of heating and cooling coils. Doors shall be minimum 375 x 450 mm, unless otherwise shown. Where duct size will not accommodate this size door, the doors shall be made as large as practicable. Doors 600 x 600 mm or larger shall be provided with fasteners operable from both sides. Doors in insulated ducts shall be the insulated type.

2.8.2.2 Splitters and Manual Balancing Dampers

Splitters and manual balancing dampers shall be furnished with accessible operating mechanisms. Where operators occur in finished portions of the building, operators shall be chromium plated with all exposed edges rounded. Splitters shall be operated by quadrant operators or 5 mm (3/16 inch) rod brought through the side of the duct with locking setscrew and bushing. Two rods are required on splitters over 200 mm (8 inches). Manual volume control dampers shall be operated by locking-type quadrant operators. Dampers and splitters shall be 2 gauges heavier than the duct in which installed. Unless otherwise indicated, multileaf dampers shall be opposed blade type with maximum blade width of 300 mm. Access doors or panels shall be provided for all concealed damper operators and locking setscrews. Unless otherwise indicated, the locking-type quadrant operators for dampers, when installed on ducts to be thermally insulated, shall be provided with stand-off mounting brackets, bases, or adapters to provide clearance between the duct surface and the operator not less than the thickness of the insulation. Stand-off mounting items shall be integral with the operator or standard accessory of the damper manufacturer. Volume dampers shall be provided where indicated.

2.8.2.3 Air Deflectors and Branch Connections

Air deflectors shall be provided at duct mounted supply outlets, at takeoff or extension collars to supply outlets, at duct branch takeoff connections, and at 90 degree elbows, as well as at locations as indicated on the drawings or otherwise specified. Conical branch connections or 45 degree entry connections may be used in lieu of deflectors or extractors for branch connections. All air deflectors, except those installed in 90 degree elbows, shall be provided with an approved means of adjustment. Adjustment shall be made from easily accessible means inside the duct or from an adjustment with sturdy lock on the face of the duct. When installed on ducts to be thermally insulated, external adjustments shall be provided with stand-off mounting brackets, integral with the adjustment device, to provide clearance between the duct surface and the adjustment device not less than the thickness of the thermal insulation. Air

deflectors shall be factory-fabricated units consisting of curved turning vanes or louver blades designed to provide uniform air distribution and change of direction with minimum turbulence or pressure loss. Air deflectors shall be factory or field assembled. Blade air deflectors, also called blade air extractors, shall be approved factory fabricated units consisting of equalizing grid and adjustable blade and lock. Adjustment shall be easily made from the face of the diffuser or by position adjustment and lock external to the duct. Stand-off brackets shall be provided on insulated ducts and are described herein. Fixed air deflectors, also called turning vanes, shall be provided in 90 degree elbows.

2.8.3 Framed Prepared Openings, Closure Collars

2.8.3.1 Framed Prepared Openings

Square and rectangular ducts passing through floors, walls, ceilings, or roof shall be installed through framed prepared openings. The Contractor shall be responsible for the proper size and location of prepared openings. Framed openings are also required where grilles, registers, and diffusers are installed at the openings. Framed prepared openings shall be fabricated from 1.0 mm (20 gauge) galvanized steel, unless otherwise indicated. Openings shall have 25 mm clearance between the duct and the opening or 25 mm clearance between the insulation and the opening for insulated ducts.

2.8.3.2 Closure Collars

Collars shall be fabricated of galvanized sheet metal not less than 100 mm wide, unless otherwise indicated, and shall be installed on exposed ducts on each side of walls or floors where sleeves or prepared openings are provided. Collars shall be installed tight against surfaces. Collars shall fit snugly around the duct or insulation. Sharp edges of the collar around insulated duct shall be ground smooth to preclude tearing or puncturing the insulation covering or vapor barrier. Collars shall be fabricated from 1.3 mm (18 gauge) galvanized steel. Collars shall be installed with fasteners on maximum 150 mm centers, except that not less than 4 fasteners shall be used.

2.8.4 Diffusers, Registers, and Grilles

Units shall be factory-fabricated of steel, corrosion-resistant steel, or aluminum and shall distribute the specified quantity of air evenly over space intended without causing noticeable drafts, air movement faster than 0.25 m/s (50 fpm) in occupied zone, or dead spots anywhere in the conditioned area. Outlets for diffusion, spread, throw, and noise level shall be as required for specified performance. Performance shall be certified according to ASHRAE 70. Inlets and outlets shall be sound rated and certified according to ASHRAE 70. Sound power level shall be as indicated. Diffusers and registers shall be provided with volume damper with accessible operator; or if standard with the manufacturer, an automatically controlled device will be acceptable. Volume dampers shall be opposed blade type for all diffusers and registers. Where the inlet and outlet openings are located less than 2 m above the floor, they shall be

protected by a grille or screen according to NFPA 90A.

2.8.4.1 Diffusers

Diffuser types shall be as indicated. Ceiling mounted units shall be furnished with anti-smudge devices, unless the diffuser unit minimizes ceiling smudging through design features. Diffusers shall be provided with air deflectors of the type indicated. Ceiling mounted units shall be installed with rims tight against ceiling. Sponge rubber gaskets shall be provided between ceiling and surface mounted diffusers for air leakage control. Suitable trim shall be provided for flush mounted diffusers. Duct collar connecting the duct to diffuser shall be airtight and shall not interfere with volume controller. Return or exhaust units shall be similar to supply diffusers.

2.8.4.2 Registers and Grilles

Units shall be four-way directional-control type, except that return and exhaust registers may be fixed horizontal or vertical louver type similar in appearance to the supply register face. Registers shall be provided with sponge-rubber gasket between flanges and wall or ceiling. Wall supply registers shall be installed at least 150 mm below the ceiling unless otherwise indicated. Return and exhaust registers shall be located 150 mm above the floor unless otherwise indicated. Four-way directional control may be achieved by a grille face which can be rotated in 4 positions or by adjustment of horizontal and vertical vanes. Grilles shall be as specified for registers, without volume control damper.

2.8.5 Louvers

Louvers for installation in exterior walls which are associated with the air supply and distribution system shall be as specified in Section 07600 SHEET METALWORK, GENERAL.

2.8.6 Gooseneck Air Vents

Gooseneck air vents shall be fabricated from minimum 1.3 mm (18 gauge), Type 304L or 316L, stainless steel. Sheet metal reinforcement, and fabrication shall conform to SMACNA HVAC Duct Const Stds. Gooseneck air vents sshall be provided with bird screen.

2.8.7 Bird Screens and Frames

Bird screens shall conform to ASTM E 437, Type I, Class 1, 2 by 2 mesh, 1.6 mm diameter aluminum wire or 0.8 mm inch diameter stainless steel wire. Frames shall be removable type or stainless steel or extruded aluminum.

2.9 AIR SYSTEMS EQUIPMENT

2.9.1 Fans

Fans shall be tested and rated according to AMCA 210. Fans may be connected to the motors either directly or indirectly with V-belt drive. V-belt drives shall be designed for not less than 150 percent of the

connected driving capacity. Motor sheaves shall be variable pitch for 11 kW (15 hp) and below and fixed pitch above 11 kW (15 hp) as defined by ARI Guideline D. Variable pitch sheaves shall be selected to drive the fan at a speed which will produce the specified capacity when set at the approximate midpoint of the sheave adjustment. When fixed pitch sheaves are furnished, a replaceable sheave shall be provided when needed to achieve system air balance. Motors for V-belt drives shall be provided with adjustable rails or bases. Removable metal guards shall be provided for all exposed V-belt drives, and speed-test openings shall be provided at the center of all rotating shafts. Fans shall be provided with personnel screens or guards on both suction and supply ends, except that the screens need not be provided, unless otherwise indicated, where ducts are connected to the fan. Fan and motor assemblies shall be provided with vibration-isolation supports or mountings as indicated. Vibration-isolation units shall be standard products with published loading ratings. Each fan shall be selected to produce the capacity required at the fan static pressure indicated. Standard AMCA arrangement, rotation, and discharge shall be as indicated.

2.9.1.1 Panel Type Power Wall Ventilators

Fans shall be propeller type, assembled on a reinforced metal panel with venturi opening spun into panel. Fans with wheels less than 600 mm (24 inches) diameter shall be direct or V-belt driven and fans with wheels 600 mm (24 inches) diameter and larger shall be V-belt drive type. Fans shall be furnished with wall mounting collar. Lubricated bearings shall be provided. Fans shall be fitted with wheel and motor side metal or wire guards which have a corrosion-resistant finish. Motor enclosure shall be dripproof type. Gravity or motor operated backdraft dampers shall be provided where indicated.

2.9.1.2 Centrifugal Type Power Roof Ventilators

Fans shall be direct or V-belt driven with backward inclined, non-overloading wheel. Motor compartment housing shall be hinged or removable and weatherproof, constructed of heavy gauge aluminum. Fans shall be provided with birdscreen, disconnect switch, gravity or motorized dampers, roof curb. Motors enclosure shall be dripproof type. Grease-laden kitchen exhaust fans shall be centrifugal type according to UL 705 and fitted with V-belt drive, round hood, and windband upblast discharge configuration, integral residue trough and collection device, motor and power transmission components located in outside positively air ventilated compartment. Lubricated bearings shall be provided.

2.9.1.3 In-Line Centrifugal Fans

In-line fans shall have centrifugal backward inclined blades, stationary discharge conversion vanes, internal and external belt guards, and adjustable motor mounts. Fans shall be mounted in a welded tubular casing. Air shall enter and leave the fan axially. Inlets shall be streamlined with conversion vanes to eliminate turbulence and provide smooth discharge air flow. Fan bearings and drive shafts shall be enclosed and isolated from the air stream. Fan bearings shall be sealed against dust and dirt and shall be permanently lubricated, and shall be precision self aligning

ball or roller type. Bearing life shall be L50 rated at not less than 200,000 hours as defined by AFBMA Std 9 and AFBMA Std 11. Motors shall have dripproof enclosure. Motor starters shall be magnetic across-the-line with general-purpose enclosures. Remote manual switch with pilot indicating light shall be provided where indicated.

2.9.1.4 Ceiling Exhaust Fans

Suspended cabinet-type ceiling exhaust fans shall be centrifugal type, direct-driven. Fans shall have acoustically insulated housing. Integral backdraft damper shall be chatter-proof. The integral face grille shall be of egg-crate design or louver design. Fan motors shall be mounted on vibration isolators. Unit shall be provided with mounting flange for hanging unit from above. Fans shall be U.L. listed.

2.9.1.5 Air-Curtain Fans

Air curtains shall be provided with a weatherproof housing constructed of high impact plastic or minimum 1.3 mm (18 gauge) rigid welded steel. Fan wheels shall be backward curved, non-overloading, centrifugal type and accurately balanced statically and dynamically. Motors shall have totally enclosed fan cooled enclosures. Motor starters shall be remote manual type with weather-resistant enclosure actuated when the doorway served is open. The air curtains shall attain the air velocities specified within 2 seconds following activation. Air intake and discharge openings shall be protected by bird screens. Air curtain unit or a multiple unit installation shall be at least as wide as the opening to be protected. The air discharge openings shall be so designed and equipped as to permit outward adjustment of the discharge air. Adjustment and installation placement shall be according to the manufacturer's written recommendation. Directional controls on air curtains for service windows shall be designed to be easily cleanable or readily removable. Air curtains shall be designed to prevent the adjustment of the air velocities specified. The interior surfaces of the air curtain units shall be accessible for cleaning. Certified test data indicating that the fan will provide the air velocities required when fan is mounted as indicated shall be furnished. Air curtains designed as fly fans shall be provided where indicated. Air curtains designed for use in service entranceways shall develop an air curtain not less than 75 mm thick at the discharge nozzle. The air velocity shall be not less than 8 m/s across the entire entryway when measured 900 mm above the floor. Air curtains designed for use on customer entranceways shall develop an air curtain not less than 200 mm thick at the discharge opening. The velocity shall be not less than 3 m/s across the entire entryway when measured 900 mm above the floor. Recirculating type air curtains shall be equipped with readily removable filters, or the filters shall be designed for in-position cleaning. The air capture compartment shall be readily accessible and easily cleanable or designed for in-position cleaning.

2.9.2 Coils

Coils shall be fin-and-tube type constructed of seamless copper or red brass tubes and aluminum or copper fins mechanically bonded or soldered to the tubes. Copper tube wall thickness shall be a minimum of 0.6096 mm (0.024 inches). Red brass tube wall thickness shall be a minimum of 1.24

mm (0.049 inches). Aluminum fins shall be 0.19 mm (0.0075 inch) minimum thickness. Copper fins shall be 0.114 mm (0.0045 inch) minimum thickness. Casing and tube support sheets shall be not lighter than 1.6 mm (16 gauge) galvanized steel, formed to provide structural strength. When required, multiple tube supports shall be provided to prevent tube sag. Each coil shall be tested at the factory under water at not less than 2.76 MPa (400 psi) air pressure and shall be suitable for 1.38 MPa (200 psi) working pressure. Coils shall be mounted for counterflow service. Coils shall be rated and certified according to ARI 410.

2.9.2.1 Water Coils

Water coils shall be installed with a pitch of not less than 10 mm per meter of the tube length toward the drain end. Headers shall be constructed of cast iron, welded steel or copper. Each coil shall be provided with a plugged vent and drain connection extending through the unit casing.

2.9.3 Air Filters

Air filters shall be listed according to requirements of UL 900, except high efficiency particulate air filters of 99.97 percent efficiency by the DOP Test method shall be as listed under the Label Service and shall meet the requirements of UL 586.

2.9.3.1 Extended Surface Pleated Panel Filters

Filters shall be 50 mm (2 inch) depth, sectional, disposable type of the size indicated and shall have an average efficiency of 25 to 30 percent when tested according to ASHRAE 52.1. Initial resistance at 2.54 m/s (500 feet per minute) shall not exceed 9 mm water gauge. Filters shall be UL Class 2. Media shall be nonwoven cotton and synthetic fiber mat. A wire support grid bonded to the media shall be attached to a moisture resistant fiberboard frame. All four edges of the filter media shall be bonded to the inside of the frame to prevent air bypass and increase rigidity.

2.9.3.2 Filters For Kitchen Exhaust Hood Service

Filter shall be sectional, permanent, washable, all metallic media type, nominal 50 mm (2 inch) thick, with suitable metal frames, designed for extraction of grease from grease-laden air. Clean filter static pressure drop shall be as indicated.

2.9.3.3 Holding Frames

Frames shall be fabricated from not lighter than 1.6 mm (16 gauge) sheet steel with rust-inhibitor coating. Each holding frame shall be equipped with suitable filter holding devices. Holding frame seats shall be gasketed. All joints shall be airtight.

2.9.3.4 Filter Gauges

Filter gauges shall be dial type, diaphragm actuated draft and shall be provided for all filter stations, including those filters which are furnished as integral parts of factory fabricated air handling units.

Gauges shall be at least 98 mm (3-7/8 inches) in diameter, shall have white dials with black figures, and shall be graduated in 0.25 mm (0.01 inch), and shall have a minimum range of 25 mm beyond the specified final resistance for the filter bank on which each gauge is applied. Each gauge shall incorporate a screw operated zero adjustment and shall be furnished complete with two static pressure tips with integral compression fittings, two molded plastic vent valves, two 1.5 m (5 foot) minimum lengths of 6.35 mm (1/4 inch) diameter aluminum tubing, and all hardware and accessories for gauge mounting.

## 2.10 AIR HANDLING UNITS

### 2.10.1 Factory-Fabricated Air Handling Units

Units shall be single-zone draw-through type or multizone blow-through type as indicated. Units shall include fans, coils, airtight insulated casing, adjustable V-belt drives, belt guards for externally mounted motors, access sections where indicated, combination sectional filter-mixing box, vibration-isolators, and appurtenances required for specified operation. Vibration isolators shall be as indicated. Each air handling unit shall have physical dimensions suitable to fit space allotted to the unit and shall have the capacity indicated. Air handling unit shall have published ratings based on tests performed according to ARI 430.

#### 2.10.1.1 Casings

Casing sections shall be 50 mm (2 inch)double wall type constructed of a minimum 18 gauge galvanized steel, or 18 gauge steel outer casing protected with a corrosion resistant paint finish according to paragraph FACTORY PAINTING. Inner casing of double-wall units shall be minimum 1.0 mm (20 gauge) solid galvanized steel. Casing shall be designed and constructed with an integral structural steel frame such that exterior panels are non-load bearing. Exterior panels shall be individually removable. Removal shall not affect the structural integrity of the unit. Casings shall be provided with inspection doors, access sections, and access doors as indicated. Inspection and access doors shall be insulated, fully gasketed, double-wall type, of a minimum 1.3 mm (18 gauge) outer and 1.0 mm (20 gauge) inner panels. Doors shall be rigid and provided with heavy duty hinges and latches. Inspection doors shall be a minimum 300 mm wide by 300 mm high. Access doors shall be minimum 600 mm wide and shall be the full height of the unit casing or a minimum of 1800 mm, whichever is less. Access Sections shall be according to paragraph AIR HANDLING UNITS. Drain pan shall be double-bottom type constructed of 16 gauge galvanized steel, pitched to the drain connection. Drain pans shall be constructed water tight, treated to prevent corrosion, and designed for positive condensate drainage. When 2 or more cooling coils are used, with one stacked above the other, condensate from the upper coils shall not flow across the face of lower coils. Intermediate drain pans or condensate collection channels and downspouts shall be provided, as required to carry condensate to the unit drain pan out of the air stream and without moisture carryover. Each casing section handling conditioned air shall be insulated with not less than 25 mm (1 inch) thick, 24 kg per cubic meter (1-1/2 pound density) coated fibrous glass material having a thermal conductivity not greater than 0.033 W/m-K (0.23 Btu/hr-sf-F). Factory applied fibrous glass

insulation shall conform to ASTM C 1071, except that the minimum thickness and density requirements do not apply, and shall meet the requirements of NFPA 90A. Foam-type insulation is not acceptable. Foil-faced insulation shall not be an acceptable substitute for use on double-wall access doors and inspections doors and casing sections. Duct liner material, coating, and adhesive shall conform to fire-hazard requirements specified in Section 15080 THERMAL INSULATION FOR MECHANICAL SYSTEMS. Exposed insulation edges and joints where insulation panels are butted together shall be protected with a metal nosing strip or shall be coated to conform to meet erosion resistance requirements of ASTM C 1071. A latched and hinged inspection door, shall be provided in the fan and coil sections. Additional inspection doors, access doors and access sections shall be provided where indicated.

2.10.1.2 Heating and Cooling Coils

Coils shall be provided as specified in paragraph AIR SYSTEMS EQUIPMENT, for types indicated.

2.10.1.3 Air Filters

Air filters shall be as specified in paragraph AIR SYSTEMS EQUIPMENT for types and thickness indicated.

2.10.1.4 Fans

Fans shall be double-inlet, centrifugal type with each fan in a separate scroll. Fans and shafts shall be dynamically balanced prior to installation into air handling unit, then the entire fan assembly shall be statically and dynamically balanced at the factory after it has been installed in the air handling unit. Fans shall be mounted on steel shafts accurately ground and finished. Fan bearings shall be sealed against dust and dirt and shall be precision self-aligning ball or roller type. Bearing life shall be L50 rated at not less than 200,000 hours as defined by AFBMA Std 9 and AFBMA Std 11. Bearings shall be permanently lubricated or lubricated type with lubrication fittings readily accessible at the drive side of the unit. Bearings shall be supported by structural shapes, or die formed sheet structural members, or support plates securely attached to the unit casing. Bearings may not be fastened directly to the unit sheet metal casing. Fans and scrolls shall be furnished with coating indicated. Fans shall be driven by a unit-mounted or a floor-mounted motor connected to fans by V-belt drive complete with belt guard for externally mounted motors. Belt guards shall be the three sided enclosed type with solid or expanded metal face. Belt drives shall be designed for not less than a 1.3 service factor based on motor nameplate rating. Motor sheaves shall be variable pitch for 20 kW and below and fixed pitch above 20 kW as defined by ARI Guideline D. Where fixed sheaves are required, variable pitch sheaves may be used during air balance, but shall be replaced with an appropriate fixed sheave after air balance is completed. Variable pitch sheaves shall be selected to drive the fan at a speed that will produce the specified capacity when set at the approximate midpoint of the sheave adjustment. Motors for V-belt drives shall be provided with adjustable bases. Fan motors shall have splashproof enclosures. Motor starters shall be magnetic across-the-line type with general-purpose enclosure. Unit fan

or fans shall be selected to produce the required capacity at the fan static pressure. The sound power level values shall be obtained according to AMCA Std 300 or ASHRAE ANSI/ASHRAE 68.

2.10.1.5 Access Sections and Filter/Mixing Boxes

Access sections shall be provided where indicated and shall be furnished with access doors as shown. Access sections and filter/mixing boxes shall be constructed in a manner identical to the remainder of the unit casing and shall be equipped with access doors. Mixing boxes shall be designed to minimize air stratification and to promote thorough mixing of the air streams.

2.10.1.6 Dampers

Dampers shall be as specified in paragraph CONTROLS.

[AM#0002]

2.11 MAKE-UP AIR UNITS

Units shall be factory-fabricated, horizontal blow thru type roof top unit as indicated. Fan, casing, cooling coil, air filters, access section and dampers shall be provided as specified in paragraph AIR HANDLING UNITS.

2.11.1 Furnace

Furnace shall be a manufacturer's standard, self-contained, forced circulated air heating type furnace as indicated. Furnace and furnace components shall be completely factory-assembled and wired. Furnace casing shall be factory insulated and be compatible with the operating temperatures. Furnace shall be provided with removable service panels which allow access to all internal components requiring cleaning, servicing, or adjustment. Furnace design shall be certified by the AMERICAN GAS ASSOCIATION LABORATORIES (AGA). Furnace shall have a minimum certified Annual Fuel Utilization Efficiency (AFUE) of not less than 80 percent. Gas-burning equipment shall include the gas burners, ignition equipment, gas-control valve, gas piping, gas-pressure regulating valve, when applicable, and accessories necessary for a fully automatic system. Gas-fired units equipped with programming controls shall be furnished both with high and with low gas supply pressure switches in the fuel supply piping. Ignition systems shall be of the direct spark, hot surface, or interrupted intermittent type with automatic electric ignition. The pilots shall be of the electrically-ignited proven type. Continuous pilots will not be permitted. Burner shall be designed in accordance with NFPA 54/ANSI Z223.1 and located so that parts are protected against overheating. Provisions shall be made in the burner housing for inspection of the pilot flame.

2.12 FACTORY PAINTING

Units which are not of galvanized construction according to ASTM A 123/A 123M or ASTM A 924/A 924M shall be factory painted with a corrosion resisting paint finish. Internal and external ferrous metal surfaces shall

be cleaned, phosphatized and coated with a paint finish which has been tested according to ASTM B 117, ASTM D 1654, and ASTM D 3359. Evidence of satisfactory paint performance for a minimum of 125 hours for units to be installed indoors and 500 hours for units to be installed outdoors shall be submitted. Rating of failure at the scribe mark shall be not less than 6, average creepage not greater than 3 mm. Rating of the inscribed area shall not be less than 10, no failure. On units constructed of galvanized steel which have been welded, exterior surfaces of welds or welds that have burned through from the interior shall receive a final shop docket of zinc-rich protective paint according to ASTM D 520 Type I.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Work shall be installed as shown and according to the manufacturer's diagrams and recommendations.

#### 3.1.1 Piping

Pipe and fitting installation shall conform to the requirements of ASME B31.1. Pipe shall be cut accurately to measurements established at the jobsite, and worked into place without springing or forcing, completely clearing all windows, doors, and other openings. Cutting or other weakening of the building structure to facilitate piping installation will not be permitted without written approval. Pipe or tubing shall be cut square, shall have burrs removed by reaming, and shall permit free expansion and contraction without causing damage to the building structure, pipe, joints, or hangers. Changes in direction shall be made with fittings, except that bending of pipe 100 mm (4 inches) and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. The centerline radius of bends shall not be less than 6 diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be accepted. Horizontal supply mains shall pitch down in the direction of flow as indicated. The grade shall be not less than 2 mm in 1 m. Reducing fittings shall be used for changes in pipe sizes. Open ends of pipelines and equipment shall be capped or plugged during installation to keep dirt or other foreign materials out of the system. Pipe not otherwise specified shall be uncoated. Connections to appliances shall be made with malleable iron unions for steel pipe 65 mm (2-1/2 inches) or less in diameter, and with flanges for pipe 80 mm (3 inches) and larger. Connections between ferrous and copper piping shall be electrically isolated from each other with dielectric unions or flanges. All piping located in air plenums shall conform to NFPA 90A requirements. Pipe and fittings installed in inaccessible conduits or trenches under concrete floor slabs shall be welded.

##### 3.1.1.1 Joints

a. Threaded Joints: Threaded joints shall be made with tapered threads and made tight with a stiff mixture of graphite and oil or polytetrafluoroethylene tape or equivalent thread joint compound or material, applied to the male threads only.

b. Soldered Joints: Joints in copper tubing shall be cut square with ends reamed, and all filings and dust wiped from interior of pipe. Joints shall be soldered with 95/5 solder or brazed with silver solder applied and drawn through the full fitting length. Care shall be taken to prevent annealing of tube or fittings when making connections. Joints 65 mm (2-1/2 inches) and larger shall be made with heat uniformly around the entire circumference of the joint with a multi-flame torch. Connections in floor slabs shall be brazed. Excess solder shall be wiped from joint before solder hardens. Solder flux shall be liquid or paste form, non-corrosive and conform to ASTM B 813.

c. Welded Joints: Welding shall be according to qualified procedures using qualified welders and welding operators. Procedures and welders shall be qualified according to ASME BPV IX. Welding procedures qualified by others and welders and welding operators qualified by another operator may be permitted by ASME B31.1. Structural members shall be welded according to Section 05090 WELDING, STRUCTURAL. All welds shall be permanently identified by imprinting the welder's or welding operator's assigned symbol adjacent to the weld. Welded joints shall be fusion welded unless otherwise required. Changes in direction of piping shall be made with welding fittings only; mitering or notching pipe to form elbows and tees or other similar type construction will not be permitted. Branch connections may be made with either welding tees or branch outlet fittings. Branch outlet fittings shall be forged, flared for improvement of flow where attached to the run, and reinforced against external strains. Beveling, alignment, heat treatment and inspection of weld shall conform to ASME B31.1. Weld defects shall be removed and repairs made to the weld, or the weld joints shall be entirely removed and rewelded. Electrodes shall be stored and dried according to AWS D1.1 or as recommended by the manufacturer. Electrodes that have been wetted or that have lost any of their coating shall not be used.

3.1.1.2 Grooved Mechanical Joints

Grooves shall be prepared according to the coupling manufacturer's instructions. Pipe and groove dimensions shall comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field shall be measured using a "go/no-go" gauge, vernier or dial caliper, or narrow-land micrometer. Groove width and dimension of groove from end of pipe shall be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints shall not be used in concealed locations.

3.1.1.3 Flanges and Unions

Except where copper tubing is used, union or flanged joints shall be provided in each line immediately preceding the connection to each piece of equipment or material requiring maintenance such as coils, pumps, control valves, and other similar items.

3.1.2 Supports

3.1.2.1 General

Hangers used to support piping 50 mm (2 inches) and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. Piping subjected to vertical movement when operating temperatures exceed ambient temperatures shall be supported by variable spring hangers and supports or by constant support hangers.

3.1.2.2 Pipe Hangers, Inserts and Supports

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69, except as modified herein. Types 5, 12, and 26 shall not be used.

a. Hangers: Type 3 shall not be used on insulated piping.

b. Inserts: Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for Type 18 inserts.

c. C-Clamps: Type 19 and 23 C-clamps shall be torqued per MSS SP-69 and have both locknuts and retaining devices, furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.

d. Angle Attachments: Type 20 attachments used on angles and channels shall be furnished with an added malleable-iron heel plate or adapter.

e. Hangers: Type 24 may be used only on trapeze hanger systems or on fabricated frames.

f. Type 39 saddles shall be used on all insulated pipe 100 mm (4 inches) and larger when the temperature of the medium is above 15.5 degrees C. Type 39 saddles shall be welded to the pipe.

g. Type 40 shields shall:

(1) be used on all insulated pipes less than 100 mm (4 inches).

(2) be used on all insulated pipes 100 mm (4 inches) and larger when the temperature of the medium is 15.5 degrees C or less.

(3) have a high density insert for pipe 50 mm (2 inches) and larger, and for smaller pipe when the insulation shows signs of being visibly compressed, or when the insulation or jacket shows visible signs of distortion at or near the type 40 shield. High density inserts shall have a density of 144 kg/cubic meter (9 pcf) or greater.

h. Horizontal Pipe Supports: Horizontal pipe supports shall be spaced as specified in MSS SP-69 and a support shall be installed not over 300 mm (1 foot) from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 1.5 m apart at valves. Pipe hanger loads suspended from steel joist with hanger loads between panel points in excess of 220 N (50 pounds) shall have the excess hanger loads suspended from panel points.

i. Vertical Pipe Supports: Vertical pipe shall be supported at each floor, except at slab-on-grade, and at intervals of not more than 5 m, not more than 2.4 m from end of risers, and at vent terminations.

j. Pipe Guides: Type 35 guides using steel reinforced polytetrafluoroethylene (PTFE) or graphite slides shall be provided where required to allow longitudinal pipe movement. Lateral restraints shall be provided as required. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered.

k. Steel Slides: Where steel slides do not require provisions for restraint of lateral movement, an alternate guide method may be used. On piping 100 mm (4 inches) and larger with medium 15.5 degrees C or greater, a Type 39 saddle may be welded to the pipe and freely rest on a steel plate. On piping under 100 mm (4 inches), a Type 40 protection shield may be attached to the pipe or insulation and freely rest on a steel slide plate.

l. High Temperature Guides with Cradles: Where there are high system temperatures and welding to piping is not desirable, the Type 35 guide shall include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe shall be separated from the slide material by at least 100 mm, or by an amount adequate for the insulation, whichever is greater.

m. Insulated Pipe: Insulation on horizontal pipe shall be continuous through hangers for hot and cold piping. Other requirements on insulated pipe are specified in Section 15080 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

3.1.3 Pipe Sleeves

Sleeves shall not be installed in structural members except where indicated or approved. Rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective wall, floor, or roof, and shall be cut flush with each surface. Pipes passing through concrete or masonry wall or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. Unless otherwise indicated, sleeves shall provide a minimum of 6 mm all-around clearance between bare pipe and sleeves or between jacket over insulation and sleeves. Sleeves in bearing walls, waterproofing membrane floors, and wet areas shall be steel pipe or cast iron pipe. Sleeves in non-bearing walls, floors, or ceilings may be steel pipe, cast iron pipe, galvanized sheet metal with lock-type

longitudinal seam and of the metal thickness indicated, or moisture resistant fiber or plastic. Except in pipe chases or interior walls, the annular space between pipe and sleeve or between jacket over insulation and sleeve, in non-fire rated walls, shall be sealed as indicated and specified in Section 07900 JOINT SEALING. Pipes passing through wall waterproofing membrane shall be sleeved as specified above, and a waterproofing clamping flange shall be installed as indicated.

3.1.3.1 Roof and Floor Sleeves

Pipes passing through roof or floor waterproofing membrane shall be installed through a 17-ounce copper sleeve or a 0.8 mm thick aluminum sleeve, each within an integral skirt or flange. Flashing sleeve shall be suitably formed, and skirt or flange shall extend not less than 200 mm from the pipe and shall be set over the roof or floor membrane in a troweled coating of bituminous cement. Unless otherwise shown, the flashing sleeve shall extend up the pipe a minimum of 50 mm above highest floor level or a minimum of 250 mm above the roof. The annular space between the flashing sleeve and the bare pipe or between the flashing sleeve and the metal-jacket-covered insulation shall be sealed as indicated. Pipes up to and including 250 mm (10 inches) in diameter passing through roof or floor waterproofing membrane may be installed through a cast iron sleeve with caulking recess, anchor lugs, flashing clamp device, and pressure ring with brass bolts. Waterproofing membrane shall be clamped into place and sealant shall be placed in the caulking recess. In lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve or conduit and sleeve, a modular mechanical type sealing assembly may be installed. Seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe/conduit and sleeve with corrosion protected carbon steel bolts, nuts, and pressure plates. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe/conduit and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe/conduit and sleeve involved.

3.1.3.2 Fire Seal

Where pipes pass through firewalls, fire partitions, or floors, a fire seal shall be provided as specified in Section 07840 FIRESTOPPING.

3.1.3.3 Escutcheons

Escutcheons shall be provided at finished surfaces where exposed piping, bare or insulated, passes through floors, walls, or ceilings except in boiler, utility, or equipment rooms. Where sleeves project slightly from floors, special deep-type escutcheons shall be used. Escutcheons shall be secured to pipe or pipe covering.

3.1.4 Condensate Drain Lines

Water seals shall be provided in the condensate drain from all units. The depth of each seal shall be 50 mm plus 0.1 mm for each Pa, of the total static pressure rating of the unit to which the drain is connected. Water seals shall be constructed as indicated. Pipe cap or plug cleanouts shall be provided where indicated. Drains indicated to connect to the sanitary waste system shall be connected by an indirect waste fitting. Air conditioner drain lines shall be insulated as specified in Section 15080 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

3.1.5 Air Vents and Drains

3.1.5.1 Vents

Air vents shall be provided at high points, on water coils, and where indicated to ensure adequate venting of the piping system.

3.1.5.2 Drains

Drains shall be provided at low points and where indicated to ensure complete drainage of the piping. Drains shall be accessible, and shall consist of nipples and caps or plugged tees unless otherwise indicated.

3.1.6 Valves

Isolation gate or ball valves shall be installed on each side of each piece of equipment such as pumps, heaters, heating or cooling coils, and other similar items, at the midpoint of all looped mains, and at any other points indicated or required for draining, isolating, or sectionalizing purposes. Isolation valves may be omitted where balancing cocks are installed to provide both balancing and isolation functions. Each valve except check valves shall be identified. Valves in horizontal lines shall be installed with stems horizontal or above.

3.1.7 Equipment and Installation

Frames and supports shall be provided for pumps, valves, air handling units, fans, coils, dampers, and other similar items requiring supports. Air handling units shall be floor mounted as indicated. The method of anchoring and fastening shall be as detailed. Floor-mounted equipment, unless otherwise indicated, shall be set on not less than 150 mm (6 inch) concrete pads or curbs doweled in place. Concrete foundations for circulating pumps shall be heavy enough to minimize the intensity of the vibrations transmitted to the piping and the surrounding structure, as recommended in writing by the pump manufacturer. In lieu of a concrete pad foundation, a concrete pedestal block with isolators placed between the pedestal block and the floor may be provided. The concrete foundation or concrete pedestal block shall be of a mass not less than three times the weight of the components to be supported. Lines connected to the pump mounted on pedestal blocks shall be provided with flexible connectors. Foundation drawings, bolt-setting information, and foundation bolts shall be furnished prior to concrete foundation construction for all equipment indicated or required to have concrete foundations. Concrete for foundations shall be as specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

3.1.8 Access Panels

Access panels shall be provided for concealed valves, vents, controls, dampers, and items requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced and maintained or completely removed and replaced. Access panels shall be as specified in Section 05500 MISCELLANEOUS METALS.

3.1.9 Flexible Connectors

Pre-insulated flexible connectors and flexible duct shall be attached to other components in accordance with the latest printed instructions of the manufacturer to ensure a vapor tight joint. Hangers, when required to suspend the connectors, shall be of the type recommended by the connector or duct manufacturer and shall be provided at the intervals recommended.

3.1.10 Framed Openings

Space between framed opening and the duct or the duct insulation shall be packed as specified in Section 07840 FIRESTOPPING for fire rated penetrations. For non-fire rated penetrations, the space shall be packed as specified in Section 07900 JOINT SEALING.

3.1.11 Metal Ductwork

Installation shall be according to SMACNA HVAC Duct Const Stds unless otherwise indicated. Duct supports for sheet metal ductwork shall be according to SMACNA HVAC Duct Const Stds, unless otherwise specified. Friction beam clamps indicated in SMACNA HVAC Duct Const Stds shall not be used. Supports shall be attached only to structural framing members and concrete slabs. Supports shall not be anchored to metal decking unless a means is provided and approved for preventing the anchor from puncturing the metal decking. Where supports are required between structural framing members, suitable intermediate metal framing shall be provided. Where C-clamps are used, retainer clips shall be provided.

3.1.12 Kitchen Exhaust Ductwork

3.1.12.1 Ducts Conveying Smoke and Grease Laden Vapors

Ducts conveying smoke and grease laden vapors shall conform to requirements of NFPA 96. Seams, joints, penetrations, and duct-to-hood collar connections shall have a liquid tight continuous external weld. Duct material shall be minimum 1.3 mm (18 gauge), Type 304L or 316L, stainless steel. Duct construction shall include external perimeter angle sized 40 mm X 40mm, except welded joint reinforcement shall be on maximum of 600 mm centers, construct reinforcement from same material as the duct (Type 304L or 316L stainless steel) continuously welded companion angle bolted flanged joints with flexible ceramic cloth gaskets where indicated; pitched to drain at low points; welded pipe coupling-plug drains at low points; welded fire protection and detergent cleaning penetration; steel framed, stud bolted, and flexible ceramic cloth gasketed cleaning access provisions where indicated. Angles, pipe couplings, frames, bolts, etc., shall be

same material as that specified for the duct unless indicated otherwise.

3.1.12.2 Exposed Ductwork

Exposed ductwork shall be fabricated from minimum 1.3 mm (18 gauge), Type 304L or 316L, stainless steel with continuously welded joints and seams. Ducts shall be pitched to drain at hoods and low points indicated. Surface finish shall match hoods.

3.1.12.3 Concealed Ducts Conveying Moisture Laden Air

Concealed ducts conveying moisture laden air shall be fabricated from minimum 1.3 mm (18 gauge), Type 300 series, stainless steel. Joints shall be continuously welded, brazed, or soldered to be liquid tight. Duct shall be pitched to drain at points indicated. Transitions to other metals shall be liquid tight, companion angle bolted and gasketed.

3.1.13 Dust Control

To prevent the accumulation of dust, debris and foreign material during construction, temporary dust control protection shall be provided. The distribution system (supply and return) shall be protected with temporary seal-offs at all inlets and outlets at the end of each day's work. Temporary protection shall remain in place until system is ready for startup.

3.1.14 Insulation

Thickness and application of insulation materials for ductwork, piping, and equipment shall be according to Section 15080 THERMAL INSULATION FOR MECHANICAL SYSTEMS. Outdoor air intake ducts and plenums shall be externally insulated up to the point where the outdoor air reaches the conditioning unit.

3.1.15 Duct Test Holes

Holes with closures or threaded holes with plugs shall be provided in ducts and plenums as indicated or where necessary for the use of pitot tube in balancing the air system. Extensions, complete with cap or plug, shall be provided where the ducts are insulated.

3.1.16 Power Roof Ventilator Mounting

Foamed 13 mm (1/2 inch) thick, closed-cell, flexible elastomer insulation shall cover width of roof curb mounting flange. Where wood nailers are used, holes shall be pre-drilled for fasteners.

3.1.17 Power Transmission Components Adjustment

V-belts and sheaves shall be tested for proper alignment and tension prior to operation and after 72 hours of operation at final speed. Belts on drive side shall be uniformly loaded, not bouncing. Alignment of direct driven couplings shall be to within 50 percent of manufacturer's maximum allowable range of misalignment.

## 3.2 FIELD PAINTING AND COLOR CODE MARKING

Finish painting of items only primed at the factory, surfaces not specifically noted otherwise, and color code marking for piping shall be as specified in Section 09900 PAINTING, GENERAL.

## 3.3 PIPING HYDROSTATIC TEST

After cleaning, water piping shall be hydrostatically tested at a pressure equal to 150 percent of the total system operating pressure for period of time sufficient to inspect every joint in the system and in no case less than 2 hours. Leaks shall be repaired and piping retested until test is successful. No loss of pressure will be allowed. Leaks shall be repaired by re-welding or replacing pipe or fittings. Caulking of joints will not be permitted. Concealed and insulated piping shall be tested in place before covering or concealing.

## 3.4 CLEANING AND ADJUSTING

Pipes shall be cleaned free of scale and thoroughly flushed of foreign matter. A temporary bypass shall be provided for water coils to prevent flushing water from passing through coils. Strainers and valves shall be thoroughly cleaned. Prior to testing and balancing, air shall be removed from water systems by operating the air vents. Temporary measures, such as piping the overflow from vents to a collecting vessel shall be taken to avoid water damage during the venting process. Air vents shall be plugged or capped after the system has been vented. Inside of air handling units, ducts, plenums, and casing shall be thoroughly cleaned of debris and blown free of small particles of rubbish and dust and then shall be vacuum cleaned before installing outlet faces. Equipment shall be wiped clean, with traces of oil, dust, dirt, or paint spots removed. Temporary filters shall be provided prior to startup of all fans that are operated during construction, and new filters shall be installed after all construction dirt has been removed from the building, and the ducts, plenums, casings, and other items specified have been vacuum cleaned. System shall be maintained in this clean condition until final acceptance. Bearings shall be properly lubricated with oil or grease as recommended by the manufacturer. Belts shall be tightened to proper tension. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or directed. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions.

## 3.5 TESTING, ADJUSTING, AND BALANCING

Testing, adjusting, and balancing shall be as specified in Section 15990 TESTING, ADJUSTING AND BALANCING OF HVAC SYSTEMS. Testing, adjusting, and balancing shall begin only when the air supply and distribution, including controls, has been completed, with the exception of performance tests.

## 3.6 PERFORMANCE TESTS

After testing, adjusting, and balancing has been completed as specified, each system shall be tested as a whole to see that all items perform as

integral parts of the system and temperatures and conditions are evenly controlled throughout the building. Corrections and adjustments shall be made as necessary to produce the conditions indicated or specified. Capacity tests and general operating tests shall be conducted by an experienced engineer. Tests shall cover a period of not less than 1 day for each system and shall demonstrate that the entire system is functioning according to the specifications. Coincidental chart recordings shall be made at points indicated on the drawings for the duration of the time period and shall record the temperature at space thermostats or space sensors, the humidity at space humidistats or space sensors and the ambient temperature and humidity in a shaded and weather protected area.

## 3.7 FIELD TRAINING

The Contractor shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of 8 hours of normal working time and shall start after the system is functionally complete but prior to the performance tests. The field instruction shall cover all of the items contained in the approved Operating and Maintenance Instructions.

-- End of Section --

SECTION 08700

BUILDERS' HARDWARE
**03/96**
**ammendment no.2**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|---|---|
| ASTM E 283 | (1991) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen |
| ASTM F 883 | (1990) Padlocks |

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

| | |
|---|---|
| BHMA-01 | (Effective thru Jun 1998) Directory of Certified Locks & Latches |
| BHMA-02 | (Effective thru Jul 1997) Directory of Certified Door Closers |
| BHMA-03 | (Effective thru Jul 1997) Directory of Certified Exit Devices |
| BHMA ANSI/BHMA A156.1 | (1997) Butts and Hinges |
| BHMA ANSI/BHMA A156.3 | (1994) Exit Devices |
| BHMA ANSI/BHMA A156.4 | (1992) Door Controls - Closers |
| BHMA ANSI/BHMA A156.5 | (1992) Auxiliary Locks & Associated Products |
| BHMA ANSI/BHMA A156.6 | (1994) Architectural Door Trim |
| BHMA ANSI/BHMA A156.7 | (1988) Template Hinge Dimensions |
| BHMA ANSI/BHMA A156.8 | (1994) Door Controls - Overhead Stops and |

| | |
|---|---|
| | Holders |
| BHMA ANSI/BHMA A156.13 | (1994) Mortise Locks & Latches |
| BHMA ANSI/BHMA A156.15 | (1995) Closer Holder Release Devices |
| BHMA ANSI/BHMA A156.16 | (1989) Auxiliary Hardware |
| BHMA ANSI/BHMA A156.18 | (1993) Materials and Finishes |
| BHMA ANSI/BHMA A156.20 | (1996) Strap and Tee Hinges and Hasps |
| BHMA ANSI/BHMA A156.21 | (1996) Thresholds |

DOOR AND HARDWARE INSTITUTE (DHI)

| | |
|---|---|
| DHI-03 | (1989) Keying Systems and Nomenclature |
| DHI-04 | (1976) Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames |
| DHI 05 | (1990) Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames |
| DHI-A115.1G | (1994) Installation Guide for Doors and Hardware |
| DHI A115-W | (Varies) Wood Door Hardware Standards (Incl All5-W1 thru A115-W9) |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 80 | (1995) Fire Doors and Fire Windows |
| NFPA 101 | (1997; Errata 97-1) Life Safety Code |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Hardware and Accessories; FIO.

Manufacturer's descriptive data, technical literature, catalog cuts, and installation instructions. Spare parts data for locksets, exit devices, closers, electric locks, electric strikes, electro-magnetic closer holder release devices, and electric exit devices, after approval of the detail drawings, and not later than 3 month(s) prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

SD-04 Drawings

Hardware Devices; GA.

Detail drawings for hardware devices for computerized keying systems, magnetic cards, keyless push button access control systems, and other electrical hardware devices showing complete wiring and schematic diagrams and other details required to demonstrate proper function of units.

SD-07 Schedules

Hardware Schedule; GA.

Hardware schedule listing all items to be furnished. The schedule shall include for each item: the quantities; manufacturer's name and catalog numbers; the ANSI number specified, sizes; detail information or catalog cuts; finishes; door and frame size and materials; location and hardware set identification cross-references to drawings; lock trim material thicknesses; lock trim material evaluation test results;corresponding reference standard type number or function number from manufacturer's catalog if not covered by ANSI or BHMA; and list of abbreviations and template numbers.

Keying Schedule; GA.

Keying schedule developed in accordance with DHI-03, after the keying meeting with the user.

SD-13 Certificates

Hardware and Accessories; FIO.

The hardware manufacturer's certificates of compliance stating that the supplied material or hardware item meets specified requirements. Each certificate shall be signed by an official authorized to certify in behalf of the product manufacturer and shall identify quantity and date or dates of shipment or delivery to which the certificates apply. A statement that the proposed hardware items appear in BHMA-01, BHMA-02 and BHMA-03 directories of certified products may be submitted in lieu of certificates.
Furnish a separate certificate of compliance attesting that hardware items conform to the Section 00700 Contract clauses pertaining to the Buy American Act.

SD-14 Samples

Hardware and Accessories; GA.

Furnish a sample of the locksets to be furnished this project. Notify the Contracting Officer and base personnel for a meeting demonstrating that the locksets to be furnished are fully compatible with the existing keying system. An existing base core, cylinder, and key will be fitted to the sample lockset. The core and cylinder shall fit the lockset without the use of adapters and without play. The key shall easily lock and unlock the lockset without binding or other difficulties. Control key shall easily remove and install cores.

1.3 PREDELIVERY CONFERENCE

Upon approval of the Hardware Schedule, the construction Contractor shall arrange a conference with the hardware supplier, Contracting Officer and the using agency to determine keying system requirements. Location of the key control storage system, set-up and key identification labeling will also be determined.

1.4 DELIVERY, STORAGE, AND HANDLING

Hardware shall be delivered to the project site in the manufacturer's original packages. Each article of hardware shall be individually packaged in the manufacturer's standard commercial carton or container, and shall be properly marked or labeled to be readily identifiable with the approved hardware schedule. Each change key shall be tagged or otherwise identified with the door for which its cylinder is intended. Where double cylinder functions are used or where it is not obvious which is the key side of a door, appropriate instructions shall be included with the lock and on the hardware schedule. Manufacturer's printed installation instructions, fasteners, and special tools shall be included in each package.

1.5 SPECIAL TOOLS

Special tools, such as those supplied by the manufacturer, unique wrenches, and dogging keys, shall be provided as required to adjust hardware items.

1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

1.7 OPERATION AND MAINTENANCE MANUALS

Six complete copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides shall be provided. The instructions for electric locks, electric strikes, electro-magnetic closer holder release devices, and electric exit devices shall include simplified diagrams as installed.

PART 2 PRODUCTS

## 2.1 GENERAL HARDWARE REQUIREMENTS

Hardware shall conform to the requirements specified herein and the HARDWARE SETS listing at the end of this section. Hardware set numbers correspond to the set numbers shown on the drawings.

## 2.2 TEMPLATES

Requirements for hardware to be mounted on metal doors or metal frames shall be coordinated between hardware manufacturer and door or frame manufacturer by use of templates and other information to establish location, reinforcement required, size of holes, and similar details. Templates of hinges shall conform to BHMA ANSI/BHMA A156.7.

## 2.3 HINGES

Hinges shall conform to BHMA ANSI/BHMA A156.1. Hinges used on metal doors and frames shall also conform to BHMA ANSI/BHMA A156.7. Except as otherwise specified, hinge sizes shall conform to the hinge manufacturer's printed recommendations.

### 2.3.1 Hinges for Reverse Bevel Doors with Locks

Hinges for reverse bevel doors with locks shall have pins that are made nonremovable by means such as a set screw in the barrel, or safety stud, when the door is in the closed position.

### 2.3.2 Contractor's Option

Hinges with antifriction bearings may be furnished in lieu of ball bearing hinges, except where prohibited for fire doors by the requirements of NFPA 80.

### 2.3.3 Pivot Hinges

Pivot hinges shall conform to BHMA ANSI/BHMA A156.4.

## 2.4 LOCKS AND LATCHES

To the maximum extent possible, locksets, latchsets and deadlocks, and all components thereof, including cylinders and removable cores, shall be the products of a single manufacturer. Lock fronts for double-acting doors shall be rounded. Strikes for wood frames and pairs of wood doors shall be furnished with wrought boxes.

### 2.4.1 Mortise Lock and Latchsets

Mortise lock, latchsets, and strikes shall be series 1000 and shall conform to BHMA ANSI/BHMA A156.13, operational Grade 1. Strikes for security doors shall be rectangular without curved lip. Mortise type locks and latches for doors 1-3/4 inches thick and over shall have adjustable bevel fronts or otherwise conform to the shape of the door. Mortise locks shall have armored fronts.

2.4.2 Auxiliary Locks and Associated Products

Mortise dead locks and dead latches, narrow style dead locks and dead latches, rim latches, dead latches, and dead bolts shall conform to BHMA ANSI/BHMA A156.5. Bolt and latch retraction shall be dead bolt style. Strike boxes shall be furnished with dead bolt and latch strikes for Grade 1.

2.4.3 Lock Cylinders (Mortise,and Rim)

Lock cylinders shall comply with BHMA ANSI/BHMA A156.5. Lock cylinder shall have not less than seven pins. Cylinders shall have key removable core lock system. A master keying system shall be provided. Construction interchangeable cores shall be provided. Disassembly of lockset shall not be required to remove core from lockset. All locksets, lockable exit devices, and padlocks shall accept same interchangeable cores.

2.4.4 Locksets for Lead-Shielded Doors

Locksets for lead-shielded doors shall be provided with factory-installed lead linings. Lead linings shall not be less than the thickness of the lead in the door in which the lockset is required.

2.4.5 Padlocks

Padlocks shall conform to ASTM F 883. Straps, tee hinges, and hasps shall conform to BHMA ANSI/BHMA A156.20.

2.4.6 Lock Trim

Lock trim shall be cast, forged, or heavy wrought construction of commercial plain design. In addition to meeting the test requirement of BHMA ANSI/BHMA A156.13, lever handles, escutcheons shall be 0.050 inch thick, if unreinforced. If reinforced, the outer shell shall be 0.035 inch thick and the combined thickness shall be 0.070 inch except that knob shanks shall be 0.060 inch thick. Lever handles shall be of plain design with ends returned to no more than 1/2 inch from the door face. Lever handle shall be of solid construction.

2.5 EXIT DEVICES AND EXIT DEVICE ACCESSORIES

Exit devices and exit device accessories shall conform to BHMA ANSI/BHMA A156.3, Grade 1.

2.5.1 Exit Devices and Auxiliary Items

Trim shall be of wrought construction and commercial plain design with straight, beveled, or smoothly rounded sides, corners, and edges. Adjustable strikes shall be provided for rim type and vertical rod devices. Open back strikes shall be provided for pairs of doors with mortise and vertical rod devices; except open back strikes shall be used on labeled doors only where specifically provided for in the published listings. Touch bars shall be provided in lieu of conventional crossbars and arms.

Escutcheons shall be provided not less than 7 by 2-1/4 inches. Escutcheons shall be cut to suit cylinders and operating trim.

2.5.2 Door Coordinator

Stop mounted door coordinator shall be Type 21A and shall be provided for each pair of doors equipped with an overlapping astragal. The coordinator may be mechanically operated and shall be capable of holding the active door of a pair open until the inactive door has preceded it in the closing cycle. Coordinator mechanism shall have an internal override device to protect the active leaf of a pair of doors and it's hinges or pivots from damage as a result of an abrupt or forced closing. When used as fire exit hardware, the coordinatorshall be listed or labeled by a nationally recognized independent testing laboratory.

2.6 KEYING

Locks shall be keyed in sets or subsets as scheduled. Locks shall be furnished with the manufacturer's standard construction key system. Change keys for locks shall be stamped with change number and the inscription "U.S. Property - Do Not Duplicate." Keys shall be supplied as follows:

| | |
|---|---|
| Locks: | 3 change keys each lock. |
| Master keyed sets: | 4 keys each set. |
| Construction keys: | 6 total. |
| Blank keys: | 150 total. |

The keys shall be furnished to the Contracting Officer arranged in a container for key control system storage in sets or subsets as scheduled.

2.7 DOOR CLOSING DEVICES

Door closing devices shall conform to BHMA ANSI/BHMA A156.4, Grade 1. Closing devices shall be products of one manufacturer for each type specified. The opening resistance of closing devices shall not exceed 15 1bf applied at the latch stile or exceed 5 1bfwhere low opening resistance is scheduled.

2.7.1 Surface Type Closers

Surface type closers shall be Grade 1, Series C02000 Full Cover with options PT-4H, Size 1 or 2 through Size 6, and PT-4D with back check position valve. Except as otherwise specified, sizes shall conform to the manufacturer's published recommendations. Closers for outswinging exterior doors shall have parallel arms or shall be top jamb mounted. Closers for doors close to a wall shall be of narrow projection so as not to strike the wall at the 90-degree open position. Closers on doors accessible to the physically handicapped shall have the closing force set for a push-pull of 2.27kg (5 pounds) applied at the knob or handle for interior doors; for exterior doors, set to the minimum required to relatch the door.

2.7.2 Floor Closers and Pivots

Floor closers shall be Grade 1 with internal dead stop for all exterior doors. Floor closers shall have cement boxes. Pivots used on doors with floor closers shall be of the same manufacturer as the floor closers. Floor plates are not required where thresholds cover the closer cement box. Floor closers shall have independent latch and sweep speed adjusting valves, backcheck, mechanical selective hold-open (except fire rated openings), and optional delayed action. Setting tools shall be furnished for use in installing floor closers. Electric pivots and floor closers shall comply with BHMA ANSI/BHMA A156.4 with modifications to ensure correct operation of electric hardware items.

## 2.8 DOOR CONTROLS - OVERHEAD HOLDERS

Door controls - overhead holders shall conform to BHMA ANSI/BHMA A156.8.

## 2.9 SMOKE DETECTORS AND ELECTRO-MAGNETIC HOLDERS

Electro-magnetic door holders shall conform to BHMA ANSI/BHMA A156.15 and shall release the door upon activation of the building fire alarm system or interruption of electric power. See Fire Alarm Riser Diagram.

## 2.10 ARCHITECTURAL DOOR TRIM

Architectural door trim shall conform to BHMA ANSI/BHMA A156.6.

### 2.10.1 Door Protection Plates

#### 2.10.1.1 Kick Plates

Kick plates shall be Type J102 stainless steel. Width of plates shall be 2 inches less than door width for single doors and 1 inchless for pairs of doors. Height shall be 16 inches, except where the bottom rail is less than 16 inches the plate shall extend to within 1/2 inch of the panel mold or glass bead. Edges of plates shall be beveled.

#### 2.10.1.2 Mop Plates

Mop plates shall be Type J103 stainless steel. Width of plates shall be 2 inches less than door width for single doors and 1 inchless for pairs of doors. The height shall be 4 inches. Edges of plates shall be beveled.

## 2.11 AUXILIARY HARDWARE

Auxiliary hardware, consisting of door stops, slide bolts, shall conform to BHMA ANSI/BHMA A156.16. Dust-proof strikes shall be Type L04011 for doors that are not fire rated. Dust-proof strikes shall be Type L04021 for fire rated doors. Self latching extension flushbolts Type 27 Other auxiliary hardware of the types listed below, shall conform to BHMA ANSI/BHMA A156.16. Door stop risers shall be used on all door stops that are not of sufficient height to stop the door.

Garment Hooks: L12011 x 626

Door Viewer L03171 x 626

## 2.12 MISCELLANEOUS

### 2.12.1 Metal Thresholds

Thresholds shall conform to BHMA ANSI/BHMA A156.21. Thresholds for exterior doors shall be extruded aluminum of the type indicated and shall provide proper clearance and an effective seal with specified weather stripping. Latching thresholds shall be of such height that the bottom of the door shall be 1/8 inch over the tread of the threshold and 1/8 inch below the top of the stop. Where required, thresholds shall be modified to receive projecting bolts of flush bolts exit devices. Thresholds for doors accessible to the handicapped shall be beveled with slopes not exceeding 1:2 and with heights not exceeding 1/2 inch. Air leakage rate of weatherstripping shall not exceed 0.5 cubic feet per minute per lineal foot of crack when tested in accordance with ASTM E 283 at standard test conditions.

### 2.12.2 Rain Drips

Extruded aluminum, not less than 0.07 inch thick, clear anodized. Door sill rain drips shall be 1-1/2 inches to 1-3/4 inches high by 5/8 inch projection. Overhead rain drips shall be approximately 1-1/2 inches high by 2-1/2 inchesprojection and shall extend 2 inches on either side of the door opening width.

### 2.12.3 Aluminum Housed Type Weatherseals

Weatherseals of the type indicated shall consist of extruded aluminum retainers not less than 0.07 inch wall thickness with vinyl, neoprene, silicone rubber, polyurethane or vinyl brush inserts. Aluminum shall be clear (natural) anodized. Weatherseal material shall be of an industrial/commercial grade. Seals shall remain functional through all weather and temperature conditions. Air leakage rate of weatherstripping shall not exceed 0.5 cubic feet per minute per lineal foot of crack when tested in accordance with ASTM E 283 at standard test conditions.

### 2.12.4 Key Control Storage System

Key control storage system shall conform to BHMA ANSI/BHMA A156.5, E8351 , capacity 150, and shall be properly labeled for key identification. Set up, identification labeling and location of the key control storage shall be as directed at the Predelivery Conference.

### 2.12.5 Door Stops

Wall stops, floor stops and combination stop and holders shall conform to BHMA ANSI/BHMA A156.16.

## 2.13 FASTENINGS

Fastenings of proper type, size, quantity, and finish shall be supplied

with each article of hardware. Machine screws and expansion shields shall be used for attaching hardware to concrete or masonry. Fastenings exposed to the weather in the finished work shall be of brass, bronze, or stainless steel. Sex bolts, through bolts, or machine screws and grommet nuts, where used on reverse-bevel exterior doors equipped with half-surface or full-surface hinges, shall employ one-way screws or other approved tamperproof screws. Screws for the jamb leaf of half-mortise and full-surface hinges attached to structural steel frames shall be one-way or other approved tamperproof type.

## 2.14 FINISHES

Unless otherwise specified, finishes shall conform to those identified in BHMA ANSI/BHMA A156.18. Where painting of primed surfaces is required, painting is specified in Section 09900 PAINTING, GENERAL.

## 2.15 HARDWARE FOR FIRE DOORS

Hardware for fire doors shall conform to the requirements of NFPA 80and NFPA 101.

# PART 3 EXECUTION

## 3.1 APPLICATION

Hardware shall be located in accordance with DHI-04 and DHI 05, except that deadlocks shall be mounted 48 inches above finish floor. When approved, slight variations in locations or dimensions will be permitted. Application shall be in accordance with DHI-A115.1G or DHI A115-W. Door control devices for exterior doors such as closers and holders, shall be attached to doors with thru bolts and nuts or sex bolts. Alternate fastening methods may be approved by the Contracting Officer when manufacturers' documentation is submitted to verify that the fastening devices and door reinforcements are adequate to resist wind induced stresses. Electric hardware items and access control devices shall be installed in accordance with manufacturer's printed installation procedures.

### 3.1.1 Hardware for Fire Doors and Smoke-Control Door Assemblies

Hardware for fire doors shall be installed in accordance with the requirements of NFPA 80. Exit devices installed on fire doors shall have a visible label bearing the marking "Fire Exit Hardware". Other hardware installed on fire doors, such as locksets, closers, and hinges shall have a visible label or stamp indicating that the hardware items have been approved by an approved testing agency for installation on fire-rated doors. Hardware for smoke-control door assemblies shall be installed in accordance with .

### 3.1.2 Door-Closing Devices

Door-closing devices shall be installed and adjusted in accordance with the templates and printed instructions supplied by the manufacturer of the devices. Insofar as practicable, doors opening to or from halls and corridors shall have the closer mounted on the room side of the door.

3.1.3 Key Control Storage Systems

Key control storage system shall be installed where directed .

3.1.4 Kick Plates and Mop Plates

Kick plates shall be installed on the push side of single-acting doors and on both sides of double-acting doors. Mop plates shall be installed on the pull side of the single acting doors.

3.1.5 Auxiliary Hardware

Lever extension flush bolts and self latching extension flushbolts Type 27 shall be installed at the top and bottom of the inactive leaf of pairs of doors. The bottom bolt shall operate into a dust-proof floor strike or threshold. Door stop risers shall be used on all door stops that are not of sufficient height to stop the door.

3.1.6 Thresholds

Thresholds shall be secured with a minimum of three fasteners per single door width and six fasteners per double door width with a maximum spacing of 12 inches. Exterior thresholds shall be installed in a bed of sealant with expansion anchors and stainless steel screws, except that bronze or anodized bronze thresholds shall be installed with expansion anchors with brass screws. Minimum screw size shall be No. 10 length, dependent on job conditions, with a minimum of 3/4 inchthread engagement into the floor or anchoring device used. Thresholds shall have ends scribed neatly to jambs.

3.1.7 Rain Drips

Door sill rain drips shall align with the bottom edge of the door. Overhead rain drips shall align with bottom edge of door frame rabbet. Drips shall be set in sealant and fastened with stainless steel screws.

3.1.8 Weatherseals

Weatherseals shall be located as indicated, snug to door face and fastened in place with color matched metal screws after door and frames have been finish painted. Screw spacing shall be as recommended by manufacturer.

3.2 OPERATIONAL TESTS

Prior to acceptance of any electrical hardware system, an operational test shall be performed to determine if devices are operating as intended by the specifications. Wiring shall be tested for correct voltage, current carrying capacity, and proper grounding. Stray voltages in lock wiring shall be eliminated to prevent locking devices from releasing in critical situations.

3.3 FIELD QUALITY CONTROL

Supplier shall inspect the completed installation and certify that the

hardware has been furnished and installed in accordance with the manufacturers' instructions and as specified. The inspection report shall identify any malfunctioning items and recommend adjustment or replacement as appropriate.

3.4 HARDWARE SETS

HW-B1 Door No. 1, 1a

| | |
|---|---|
| 1 ½ pr. | Hinges, A2112 x 626 |
| 1 ea. | Lockset, F12 X 626 (with min. 1" dead bolt throw) |
| 1 ea. | Closer, C02011 x 689 |
| 1 ea. | Kickplate, J102 x 630 |
| 1 ea. | Stop, L12161 x 626 |
| 1 set | Weatherstripping, at head and jambs |
| 1 ea. | Threshold, J32130 as detailed x 628 |
| 1 ea. | Door Viewer, L03171 x 626 |
| 1 ea. | Door shoe, R3C535 x 628 (attachment screws on both sides of door)(door shoe shall have ends scribed neatly to jambs.) |

HW-B2 Door No. 2

| | |
|---|---|
| 1 ½ pr. | Hinges, A2112 x 626 |
| 1 ea. | Lockset, F07 - Grade 1, x 626 |
| 1 ea. | Stop, L12141 x 626 |
| 1 ea. | Garment hook, L12011 x 626 |

HW-B3 Door No. 3

| | |
|---|---|
| 1 ½ pr. | Hinges, A2112 x 626 |
| 1 ea. | Latchset, F01 - Grade 1, x 626 |
| 1 ea. | Deadbolt E1111 x 626 |
| 1 ea. | Stop, L12141 x 626 |

HW-B4 Door No. 4

| | |
|---|---|
| 1 ½ pr. | Hinges, A2112 x 626 |
| 1 ea. | Latch bolt, F19 - Grade 1,x 626 |
| 1 ea. | Garment hook, L12011 x 626 |
| 1 ea. | Stop, L12161 x 626 |
| 1 ea. | Threshold, as detailed x marble |

HW-B5 Door No. 5

1 ½ pr. Hinges, A2112 x 626
1 ea. Latch bolt, F19 - Grade 1,x 626
1 ea. Garment hook, L12011 x 626
1 ea. Stop, L12161 x 626

HW-B6 Door No. 6 (Fire Rated)

1 ½ pr. Hinges, A5111 x 630
1 ea. Lockset, F12 - Grade 1,X 626 (with min. 1" dead bolt throw)
1 ea. Closer, C02011 PT-4G x 689
1 ea. Kickplate, J102 x 630
1 ea. Stop, L12161 x 626
1 ea. Threshold, J32130 as detailed x 628
1 ea. Door shoe, R3C535 x 628(attachment screws on both sides of door)
(door shoe shall have ends scribed neatly to jambs.)
1 set Weatherstripping, at head and jambs

HW-B7 Door No. 7 (Fire Rated)

1 ½ pr. Hinges, A5111 x 630
1 ea. Lockset, F12 - Grade 1,X 626 (with min. 1" dead bolt throw)
1 ea. Closer, C02021, PT-4G x 689
1 ea. Kickplate, J102 x 630
1 ea. Overhead stop, C02541 x 626
1 ea. Threshold, J36130 as detailed x 628

HW-B8 Door No. 8 (Fire Rated)

1 ½ pr. Hinges, A5111 x 630
1 ea. Lockset, F12 - Grade 1,x 626 (with min. 1" dead bolt throw)
1 ea. Closer, C02021, PT-4G x 689
1 ea. Kickplate, J102 x 630
1 ea. Stop, L12161 x 626
1 ea. Threshold, as detailed x marble

HW-B9 Door No. 9

1 ½ pr. Hinges, A2112 x 626
1 ea. Lockset, F12 - Grade 1,x 626 (with min. 1" dead bolt throw)

1 ea. Stop, L12141 Stop, x 626

HW-B10 Door No. 10 (Fire Rated)

2 ea. Pivots, C07202, by door manufacturer x finish to match door
1 ea. Intermediate pivot, C07382 by door manufacturer x finish to match door
1 ea. Lockset, F12 - Grade 1,x finish to match door
2 ea. Closers, C02041, PT-4G by door manufacturer x finish to match door
2 ea. Stops, L12161 x 626
1 ea. Threshold, as detailed x Marble

HW-B11 Door No. 11 (Fire Rated)

1 ½ pr. Hinges, A5111 x 630
1 ea. Lockset, F12 - Grade 1,x 626 (with min. 1" dead bolt throw)
1 ea. Closer, C02011, PT-4G x 689
1 ea. Kickplate, J102 x 630
1 ea. Mop Plate, J103 x 630
1 ea. Stop, L12161 x 626
1 ea. Threshold, as detailed x marble

HW-B12 Door No. 12 (Fire Rated)

1 ½ pr. Hinges, A5111 x 630
1 ea. Lockset, F12 - Grade 1,x 626 (with min. 1" dead bolt throw)
1 ea. Closer, C02011, PT-4G x 689
1 ea. Kickplate, J102 x 630
1 ea. Electromagnetic holder, C00011 x 689 (see Fire Alarm Riser)
1 ea. Stop, L12141 x 626
1 ea. Threshold, as detailed x marble

HW-B12a Door No. 12a (Fire Rated)

1 ½ pr. Hinges, A5111 x 630
1 ea. Lockset, F12 - Grade 1,x 626 (with min. 1" dead bolt throw)
1 ea. Closer, C02011, PT-4G x 689
1 ea. Kickplate, J102 x 630
1 ea. Stop, L12141 x 626
1 ea. Threshold, as detailed x marble

HW-B13 Door No. 13 (Fire Rated, Refer Door Schedule)

Type "J" shall have:

| | |
|---|---|
| 1 ½ pr. | Hinges, A8111 x 652 (wide throw)(w/NRP x security safety studs) by door manufacturer, (height & gage, as necessary for proper support and operation of the door) |
| 1 ea. | High security hasp, as detailed, by esing agency |
| 1 ea. | Padlock, to be provided by the using agency |
| 1 ea. | Slide bolt, L54161 x 630 (Arms room side of door) |
| 1 ea. | Surface pull, D1791 x min. 7" length x 603 |
| 1 ea. | Stop, L12131 x 626 x ES (heavy duty, or as necessary to accommodate weight of door) |
| 1 ea. | Closer, C02011, PT-4G x 689 |
| 1 ea. | Electromagnetic holder, C00011 x 689 (see Fire Alarm Riser) |

Type "G" shall have:

| | |
|---|---|
| 1 1/2 pr. | Hinges A8111 x 652 (swing clear)(w/NRP x security safety studs)by day-gate manufacturer, welded to gates and frame as detailed. |
| 1 ea. | High security hasps, as detailed, by using agency |
| 1 ea. | Padlocks, to be provided by the using agency |
| 1 ea. | Stops, L12131 x 626 x ES (heavy duty, or as necessary to accommodate weight of door) |

HW-B14 Door no. 13a (Fire rated, refer to door schedule)

Type "J1" shall have:

| | |
|---|---|
| 2 ea. | Hinges, A8111 x 652 (wide throw)(w/NRP x security safety studs) by door manufacturer, (height & gage, as necessary for proper support and operation of the door) |
| 1 ea. | Highe security hasp, as detailed, by using agency |
| 1 ea. | Padlock, to be provided by the using agency |
| 1 ea. | Slide bolt, L54161 x 630 (Arms room side of door) |
| 1 ea. | Surface pull, D1791 x min. 7" length x 630 |
| 1 ea. | Closer, C02011, PT-4G x 689 |
| 1 ea. | Electromagnetic holder, C00011 x 689 (see Fire Alarm Riser) |

Type "G1" shall have:

| | |
|---|---|
| 2 ea. | Hinges, A8111 x 652 (180 degree swing) (w/NRP x security safety studs) by day-gate manufacturer, welded to gates and frame as detailed |
| 1 ea. | High security hasp, as detailed, by using agency |
| 1 ea. | Padlocks, to be provided by the using agency |

HW-B15 Door No. 14 (Dutch Door)(Fire Rated)

| | |
|---|---|
| 2 ea. | Spring Hinges, K81011F, 630 (for bottom portion of door) |
| 2 ea. | Hinges, A5111 x 630 (for top portion of door) |
| 2 ea. | Locksets, F12 - grade 1 x 626 |
| 1 ea. | Closer, C02011, PT-4G x 689 (for top portion of door) |
| 1 ea. | Threshold, J32100 x 628 |
| 1 ea. | Electromagnetic holder, C00011 x 689 (see Fire Alarm Riser) |
| 1 ea. | Kickplate, J102 x 630 |

HW-B16 Door No. 15 (Fire Rated)

| | |
|---|---|
| 1 ½ pr. | Hinges, A5111, 630 (wide throw) |
| 1 ea. | Lockset, F12 - grade 1 x 626 (with min. 1" dead bolt throw) |
| 1 ea. | Closer, C02011, PT-4G x 689 |
| 1 ea. | Kickplate, J102 x 630 |
| 1 ea. | Overhead stop, C08541 x 626 |
| 1 ea. | Threshold, J32100 x 628 |
| 1 ea. | Electromagnetic holder, C00011 x 689 (see Fire Alarm Riser) |

HW-B17 Door No. 16

| | |
|---|---|
| 3 pr. | Hinges, A5111 x 630 |
| 1 ea. | Lockset, F12 - grade 1 x 626 (with min. 1" dead bolt throw) |
| 2 ea. | Closers, C02021 x 689 |
| 1 set | Self Latching Extension Flush Bolt (Type 27) x 626 |
| 2 ea. | Overhead stop, C03541 x 626 |
| 2 ea. | Dustproof strike, L04021 x 626 |
| 2 ea. | Kickplates, J102 x 630 |
| 1 ea. | Threshold, J34170 as detailed x 628 |
| 1 ea. | Door hook (approx. 1/16" thick) x 628 |
| 1 set | Weatherstripping, at head, jambs and meeting stiles |
| 1 set | Rain drip, (overhead and sill) x 628 |

HW-B18 Door No. 17

| | |
|---|---|
| 3 pr. | Hinges, A5111 x 630 |
| 1 ea. | Exit device, type 8, Function 08 x RHR x 630 |
| 1 ea. | Exit device, type 8, Function 02 x trim to match active door x 630 |
| 2 ea. | Closers, C02021 x 689 |
| 2 ea. | Overhead stop, C03541 x 626 |
| 2 ea. | Kickplates, J102 x 630 |
| 1 ea. | Threshold, J32130 as detailed x 628 |
| 1 ea. | Door shoe, R3C535 x 628(attachment screws on both sides of door) (door shoe shall have ends scribed neatly to jambs.) |
| 1 set | Weatherstripping, at head, jambs and meeting stiles |
| 2 ea. | Kickplates, J102 x 630 |

HW-B19 Door No. 18

| | |
|---|---|
| 1 set | Pivot, C07162, by manufacturer x Finish to match doors |
| 1 ea. | Intermediate pivots, C07382, by door manufacturer x finish to match door |
| 1 ea. | Exit device, type 8, Function 08 x 630 |
| 1 ea. | Closers, C02021, PT-4G x finish to match doors |
| 2 ea. | Overhead stop, C02541 x finish to match door |
| 1 set | Weatherstripping @ head and jambs |
| 1 ea. | Threshold, J32130 as detailed x 628 |
| 1 ea. | Door shoe, R3C535 x 628(attachment screws on both sides of door) |

HW-B20 Door No. 19 (Fire Rated)

| | |
|---|---|
| 1 ½ pr. | Hinges, A5111 x 630 |
| 1 ea. | Lockset, F07 - grade 1 x 626 |
| 1 ea. | Closer, C02011, PT-4G x 689 |
| 2 ea. | Kickplates, J102 x 630 |
| 1 ea. | Stop, L12161 x 626 x ES |
| 1 ea. | Threshold, J32100 as detailed x 628 |
| 1 set | Weatherstripping, at head and jambs |

HW-B21 Door No. 20 (Fire Rated)

| | |
|---|---|
| 2 pr. | Pivots, C07162, by door manufacturer x finish to match door |
| 2 ea. | Intermediate pivots, C07382, by door manufacturer x finish to match door |
| 1 ea. | Lockset, F12 - grade 1 x finish to match door (key to be on corridor side of door) |
| 2 ea. | Closers, C02011, PT-4G x finish to match doors (provide adapter as needed to allow for clearance of overhead holder) |
| 1 set | Auto flushbolts, Type 25 x 626 |
| 2 ea. | Stops, L12161 x 630 |
| 1 ea. | Threshold, as detailed x marble |
| 1 set | Weatherstripping @ head and jambs and meeting stiles |

HW-B22 Door No. 21

| | |
|---|---|
| 1 set | Pivot, C07162 set by manufacturer x Finish to match door |
| 1 ea. | Intermediate pivots, C07382, by door manufacturer x finish to match door |
| 1 ea. | Exit device, type 6, function 08 x Finish to match door |
| 1 ea. | Closers, C02021, PT-4G x finish to match door (provide adapter as needed to allow for clearance of overhead holder) |
| 2 ea. | Overhead stops, C02541 x finish to match door |

1 set Weatherstripping @ head and jambs
1 ea. Threshold, J32100 as detailed x 628
1 ea. Door shoe, R3C535 x 628(attachment screws on both sides of door)

HW-B23 Door No. 22 (Fire Rated)

1 ½ pr. Hinges, A5111 x 630
1 ea. Lockset, F12 - grade 1 x 626 (with min. 1" dead bolt throw)
1 ea. Closer, C02011, PT-4G x 689
1 ea. Kickplate, J102 x 630
1 ea. Overhead stop, C02541 x 626
1 ea. Stop, L12161 x 626
1 ea. Threshold, J32130 as detailed x 628
1 ea. Mop plate, J103 x 630

HW-B24 Door BSMT

4 pr. Hinges, A5111 x 630
1 ea. Lockset, F12 - grade 1 x 626 (with min. 1" dead bolt throw)
2 ea. Flushbolt, L14261 X 626
1 ea. Overhead stop, C02541 x 630
1 ea. Threshold, J321070 as detailed x 628
1 set Rain drips (overhead and sill) X 628
1 set Weatherstripping at head, jambs, and meeting stiles
1 ea. Door shoe, R3C535 x 628 (attachment screws on both sides of door)
1 ea. Rain drip, Zero #142 x 628

**am #002 HW-B25 Door no. 23 (Fire Rated)**

**3 pr. Hinges A5111 x 630**
**1 ea. Lockset, F12 x 630**
**2 ea. Closers, C72021, PT-4G X 689**
**1 set Self Latching Extension Flush Bolt (Type 27) x 626**
**2 ea. Overhead stop, C03541 x 626**
**2 ea. Dustproof strike, L04021 x 626**
**2 ea. Kickplates, J102 x 630**
**1 set Weatherstripping at head, jambs, and meeting stiles**
**1 ea. Threshold interlocking, J34170 x 626 (with applied hook) am #002**

-- End of Section --